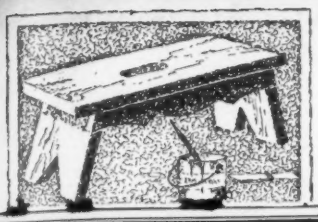
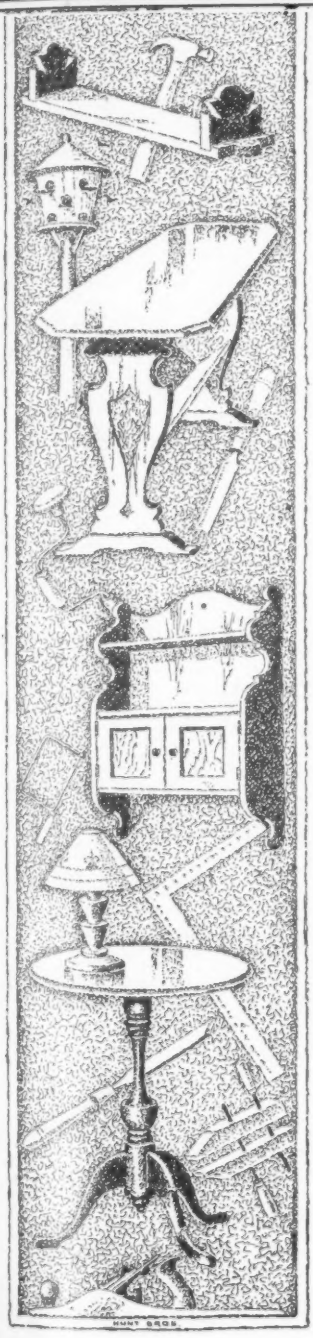
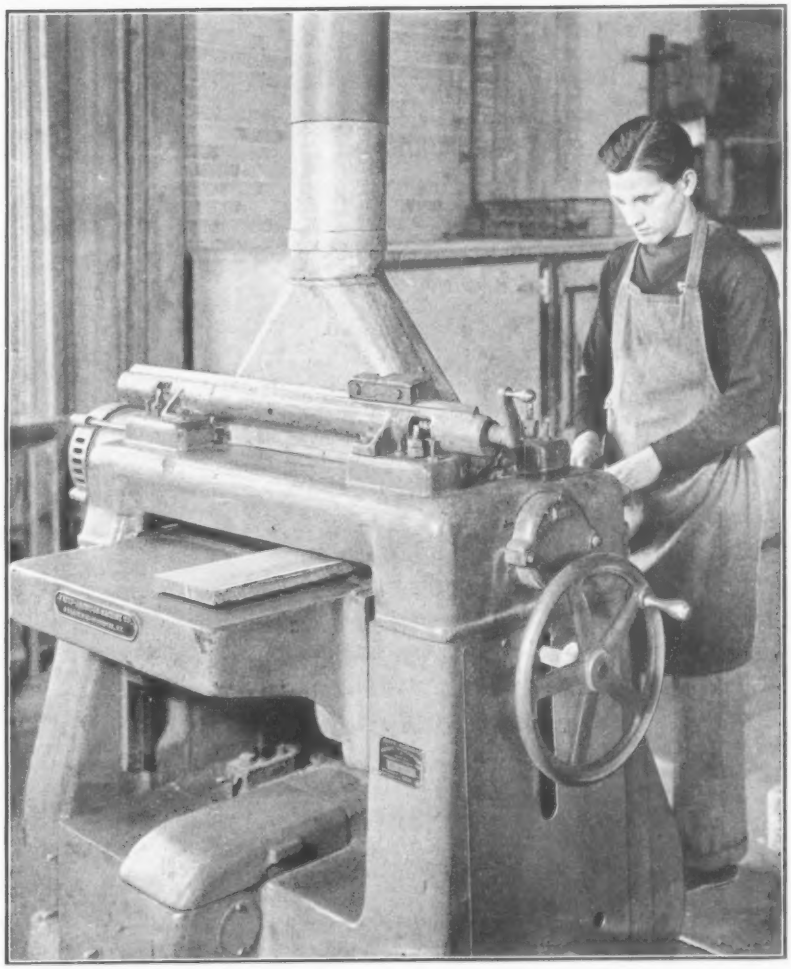


APRIL 1934

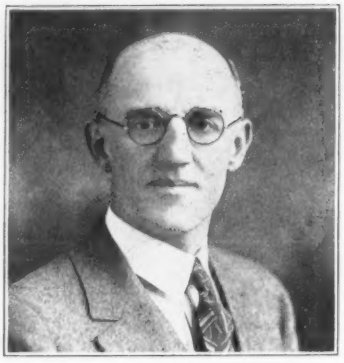
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION





The Bruce Publishing Company
New York Milwaukee Chicago

Something was bound to happen» »



F. E. TUSTISON

A. G. BROWN

. . . . when these two teachers began to teach together. And it did! They had ideas — these two — ideas about teaching woodworking that were original and advanced and aggressive, a good seven leagues ahead of most things that had been done before. They met at that shop man's Mecca — The Stout Institute — where it didn't take them long to discover how their ideas clicked. After that, there was a vital thing to do: allow teachers to follow their thinking. First, it was their pioneer collection of loose-leaf job sheets. Then came their magnum opus — the first junior-high-school woodworking text to be outlined: INSTRUCTIONAL UNITS IN HAND WOODWORK. It incorporated the same sound, substantial, and sane methods which had characterized their teaching. The thirty-nine units included were each completely analyzed. Directions clear and distinct were presented. The choice and wealth of illustrative material were an indication of how thoroughly the authors had become familiar with the specific problem of teaching junior-high-school boys the essentials of woodworking. That the esteem in which America's industrial-arts men hold Messrs. Tustison and Brown is entirely justified has been demonstrated by the acceptance given their excellent text. If you are still among those who have not accepted this noteworthy contribution, we suggest you write, wire, or radiogram for a copy so that you can keep pace with the finest teaching material for the "new deal" woodworking shop.

Bruce—Milwaukee

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
April, 1934
Vol. 23, No. 4

Training for Esthetic Values

Burl N. Osburn

State Teachers College,
Millersville, Pennsylvania

In utilizing industrial-arts work for widening the range of life situations in the curriculum of modern education, it is of extreme importance that the esthetic values of the subject be not overlooked.

"Beauty is truth, truth beauty," — that is all
Ye know on earth, and all ye need to know.
— Keats, *Ode on a Grecian Urn.*

IT IS the purpose of this discussion to set forth those phases of industrial-arts education which especially have to do with the development of appreciation for beauty, particularly in those objects commonly classed as "utilitarian." It is to be admitted at the outset that there are few, if any, commonly accepted criteria of beauty, but that is a relatively unimportant matter. The real issue is that of the search for beauty, in whatever form it is believed to be in.

Modern education is attempting, among other things, to widen and enrich the individual's range of interest and sources of enjoyment and appreciation through providing varied and vital experiences. The junior high school, with its broad curriculum, is but one evidence of this movement which is being felt in every area of education. In order to keep pace, curricula are being revised constantly, and books rewritten to include the elements of life situations of a worthy type. Many areas of school life are being reorganized to yield a greater range and depth of interest and value; each attempting to make its specific contribution to what Snedden calls the ". . . higher forms of euthenic [utilization] tastes or cultural appreciations of clothes, food, housing, furniture, personal decoration, medical service, and other relative material adjuncts of life."[1]

These newly organized courses recognize the necessity for specific training in the forming of accurate and reasoned judgments in the consumatory areas of life, as well as in the activities of production.

Many educators have been slow to recognize the possibilities of utilizing the practical arts to attain these goals. In the field of industrial-arts education, such recognition probably has been retarded by the rather formalized trade-training type of work inherited from "manual-training" days, which has obscured more general outcomes.

Early "manual training" was too definitely committed to the training of the faculties and to technical achievement to be seriously interested in esthetic or artistic values.[2] The period of its early growth coincided with that of free-hand drawing in the United States, and the Arts and Crafts Movement in England. These, among other forces, compelled attention to the artistic product; the modification resulting in "manual arts," which was primarily concerned with the production of artistic craft work in the schools.

Even this failed to keep pace with the need for a kind of education capable of effectively interpreting to boys and girls the basic resources and industries upon which their lives depend. At its best, industrial-arts education makes this possible by bringing to the school laboratory and its related areas, a representation of essential mechanical and manufacturing activities. It thus carries on a phase of general education through the development of socially worth-while attitudes, knowledges, and skills, related to the production and appreciation of utilitarian products. Such a program may encompass social studies, invention, and production in their mechanical and scientific aspects; the discovery of interests; and the development of judgments of value relative to consumatory satisfactions. In connection with the last named, the cultural development has possibilities which have scarcely been touched. Culture here is not merely the accumulation of facts, but the "distillation of sensitivity" which remains after facts are forgotten.

Probably Bonser was right when he wrote: "The real art problems of most of us are not those of designing and producing art products, but of selection

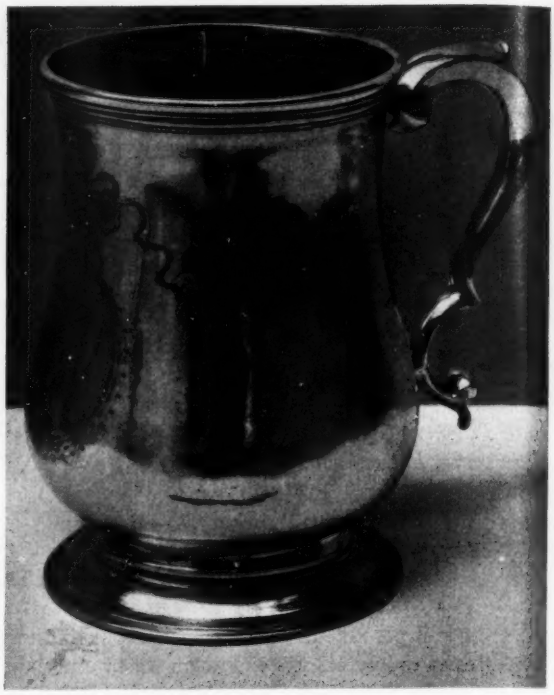
[1] Snedden, David, *Cultural Education and Common Sense* (New York: The Macmillan Company, 1931), p. 149.

[2] Woodward, in his *Manual Training in Education* (1898), makes but one reference to esthetic values: "In this work [wood carving] . . . the aim should be . . . to cultivate correct tastes in the matter of surface ornamentation, and to enable one to better appreciate artistic and manual skill" (p. 90).

and composition of good produced by commercial methods."[3]

Many industrial-arts teachers have thought of artistic[4] and esthetic training as something quite remote from their work, and have scorned it as something unnecessary, or evaded it as a mystery. Part of this attitude may have been due to mistaken conceptions of the meaning of "art" and "fine art." Fine art has sometimes been thought of as something abstract or undefiled by use. Those who defend this view fail to realize that an easel picture is as truly an object of consumatory experiences as is a chair or a pair of shoes. From this standpoint there can be no real distinction. The term "fine art" has been reserved by some to apply only to work done in certain media, such as oil paints, or marble. "Art metal" has been included, at times, because of the value of the materials used; while ceramics came within the fold through its earlier use of china painting. Objects having some socially ostentatious use; utilitarian objects preserved from an earlier day, or transported from a different culture, are sometimes classed as fine art, while objects of a similar character which are of common use or modern origin are denied the term. Dewey says: "It is a fact that art, so far as it is truly art, is a union of the serviceable and immediately enjoyable, of the instrumental and consumatory, that makes it impossible to institute a difference in kind between useful and fine art."[5]

"Art" may be thought to be a *way of doing things*, or the process of changing the products of nature to a form "fitted for perception." "Fine art," then, may be defined as the *highest degree of perfection achieved in any kind of work, and as judged by the standards of that work*."[6] If this be true, the teacher of industrial arts has a common duty with the teacher of traditional "fine arts," in advancing the learner toward the development of artistic and esthetic goals. The forge and the potter's wheel take their places with the brush and the burin as effective means to this end.[7]



Mug — Silver — American — Paul Revere. (1735–1818.) Courtesy of The Metropolitan Museum of Art, New York, N. Y.

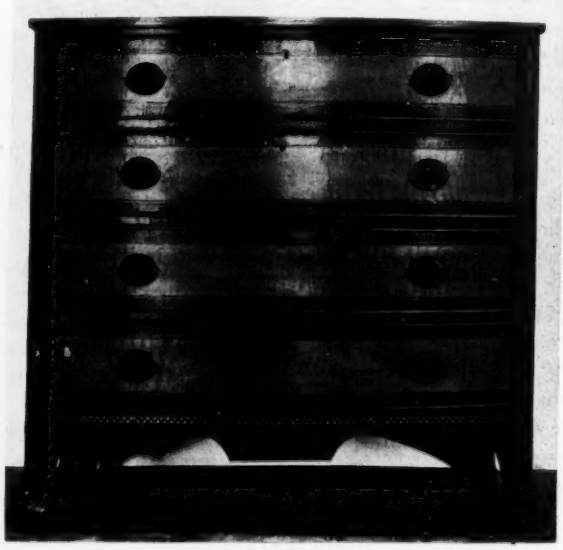
Those who speak of the need for specific education sometimes fail to recognize and point out the need for specific training in enjoyment and appreciation of fine-art products, as well as in the skills of production. They overlook the fact that the development of judgment in the selection and composition of objects of fine-art quality does not take place without experience in making such selection and using such products. The iron worker, for instance, may not appreciate fine books; the bookbinder may see little meaning in stained-glass windows; while the glass worker may not be able to enjoy a tapestry or oriental rug. If this were not the case, each individual might be able to enjoy one part of a museum of art as much as another part. Usually, each person turns for the greatest enjoyment to those things about which he best understands the history, the esthetic qualities, and the skills necessary to their production. True meanings are more evident in these things, than in those about which less is known, or which are foreign to one's experiences.

Real appreciation, then, involves not only the knowledge of a few facts about a product, but the "feel" of

[3]Bonser, Frederick G., *Life Needs and Education* (New York: Teachers College, Columbia University Press, 1932), p. 145.

[4]Following Dewey's distinctions, the term "artistic" is used here to designate activities by which works of art are brought into existence, and "esthetic" for the appreciation of them when created.

[5]Dewey, John, *Art and Education* (Merion, Pennsylvania: The Barnes Foundation Press, 1929), p. 8.



American made Georgian-Style Bureau. Brooklyn Museum, Brooklyn, N. Y.

[6]Brett, Axel, *A Critical Approach to an Aesthetic Theory* (Urbana: University of Illinois, 1926). Abstract of Ph.D. thesis, 1923, p. 25.

[7]If this interpretation is accepted, the term "art metal" no longer has significance as designating a peculiar "gift shop" type of work, or the products of any group of metals.

Wrought-iron entrance door and side grilles with plate-glass enclosures. Residence of Herbert Coppell, Esq., Tenafly, N. J. Made by The Iron-Craftsmen, Philadelphia, Pa. Mr. H. T. Lindeberg, New York City, architect

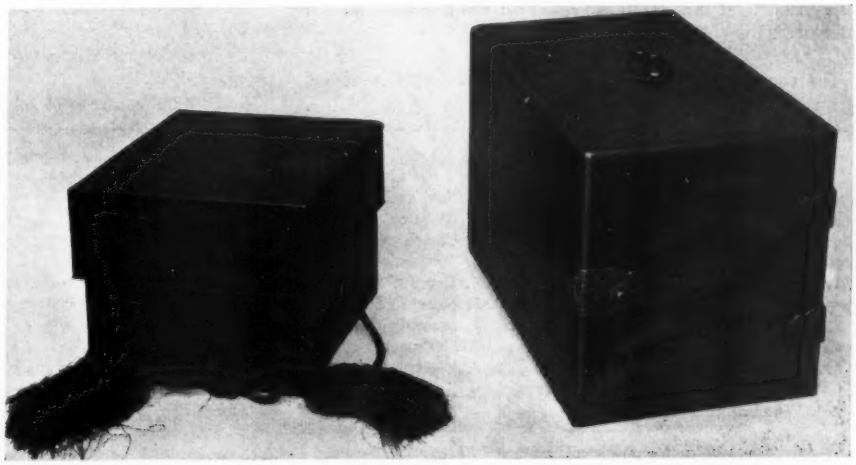
the material and the technical operations required in its making. Without actual experience in the manipulative acts, much of the essence of appreciation is lost. The individual who possesses the highest degree of such skill is potentially more capable of effective appreciation than one who is less skilful. Bennett says: "[Appreciators] . . . are those who are conscious of the presence of beauty in design, in curve, in color combinations; they are the ones who frequent art museums, who seek out the choicest patterns in textile materials and home decorations; they admire fine buildings and fine books and paintings, colorful gardens and pageantry, exquisite jewelry and sculptured marble; they are sensitive to beauty in many forms. The appreciators are the real consumers of art products."[8]

Even this relatively specific objective of esthetic appreciation may be divided into more definite parts. Certain of these stand out as being both possible and deserving of consideration in industrial-arts education. Even a casual examination of the following list will reveal potential fields of study and research for the curriculum maker, and rich rewards for the practical teacher. These are some of the elements in esthetic training:

1. Widening the range of sources from which pleasure may be gained.
2. Gaining an appreciation of the techniques employed by the artist-craftsman.
3. Giving meaning to objects — sensing the romance in their origin.
4. Improving accuracy and definiteness of appraisal of values; refinement of discrimination; or recognition of merit.
5. Learning to predict one's future response to the continued stimulus of an object.
6. Creating standards of appreciation (an integrated taste) which will be confirmed by future experiences.
7. Providing guidance in the selection of source material for creative purposes (museum vs. trade catalog).
8. Providing a rich background of experience from which forms may be drawn for creative expression.
9. Recognizing the compatibility of medium and method of treatment.

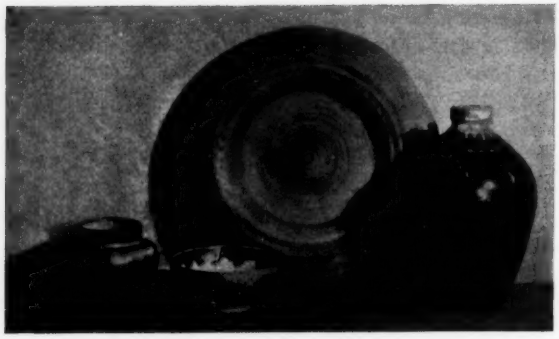
The essential point is the part played by the manipulative experiences in the development of true appreciation. The musician gains a peculiar thrill from an artistic performance through his ability to feel himself in the performer's place. The athlete probably derives keener enjoyment from seeing a form of sport in which he has participated than does the nonparticipant. It is only through this emotional experience of empathy that the consumatory experience reaches its highest peak of appreciation.

The same principle may be applied to the appreciation of fine art in whatever form it may be seen. In the industrial arts, such appreciation is widened through contact with various media. The experiences gained



Two boxes belonging to a Japanese marriage set — 17th century — lacquer. Courtesy of The Metropolitan Museum of Art, New York, N. Y.

[8] Bennett, Charles A., *Art Training for Life and for Industry* (Peoria, Ill.: The Manual Arts Press, 1923), p. 25.



Pottery by Arthur E. Baggs, The Ohio State University, Columbus, Ohio.

from this form of education offer the learner the necessary trial and error, success and failure, investigation and experiment, and analysis and comparison, necessary to the development of appreciation. It is only through these that the learner comes to understand something of the discipline of self and the conquest of the materials and forces of nature necessary in artistic creation. It is only through these that it is possible to understand how easy it is to produce the commonplace and how difficult to create the beautiful.

The implications of such objectives on the program of industrial-arts education are many. A group of pupils may *study* facts about esthetic values ("art statistics"), or *see* the processes of manufacture without the necessity for a laboratory. The essential factor of *experience* is lacking to give the learning reality. Further, such values are not general, but specific. Training in good taste in the selection and use of furniture has little value in enabling one to select and use ceramic products or clothing. The development of esthetic consumer knowledges is a highly personal thing. There is no criterion of such worth in cost, popularity, advertising ballyhoo, or the recommendation of friends or experts. Each individual must be enabled to have the necessary experiences for himself. To achieve such broad training requires more than can be provided by any one traditional unit shop. There must be comprehensive laboratory facilities capable of dealing with many types of materials; a curriculum which looks beyond the conventional materials or adherence to a narrow formula of tool skills; a flexible organization, and a master teacher.

A Course in Auto Mechanics

Max Drucker

Chairman, Mechanical-Arts Department, Bryant High School, Long Island City, New York

An outline of study that may help other teachers of auto mechanics in the high school in planning their work. The material shown may be used as it is or it may be changed to suit conditions.

AUTO mechanics was chosen as one of the shop courses for Bryant High School because:

1. Long Island City is an industrial center, in which one of the large industries is automoblie construction and repair.

2. This is an age of mechanical efficiency and the automobile is an article of major interest to boys.

3. The boys electing industrial-arts work have a definite liking for mechanical work. They should be offered an opportunity to correlate the sciences with manual-arts work in such a way that their interest in the practical will awaken a similar interest in the theoretical.

Aims and Objectives

The course in auto mechanics outlined herewith is offered as an elective in a high school.

The aim of the course is to present the basic principles of science as applied to the automoblie and to provide an opportunity to visualize these principles by definite projects.

The objectives are:

1. To create an interest in the sciences.

2. To help the student learn something about the principles which underlie the successful operation of the automobile.

3. To make the student realize the importance of extreme accuracy.

4. To inculcate respect for labor, skill, and honest effort.

COURSE I

First Week

General Introduction

The use of the automobile and its place in the development of transportation.

Stages of Development

1. Man power — the Japanese jinrikisha man.
2. Animal power — dog sled, oxcarts, mules, horses, etc.
3. Engine power
   - *a*) Stationary, as used for cable cars, generating plants for electrical lines, etc.
   - *b*) Movable — locomotives, automobiles, motorcycles, airplanes.

Advantages of Liquid Over Solid Fuel

Easier to handle; leaves no residue, etc.

The Automobile

General Inspection of Parts

Location and use of:

1. Engine
2. Clutch
3. Transmission
4. Drive Shaft
5. Rear End
6. Steering Gear
7. Carburetor
8. Electric System
9. Ignition System:
   - *a*) Battery
   - *b*) Coil
   - *c*) Distributor
   - *d*) Spark Plugs
10. Cooling System:
    - *a*) Pump
    - *b*) Radiator
    - *c*) Water Jackets
    - *d*) Temperature Gauge
    - *e*) Thermostat
    - *f*) Shutters
    - *g*) Fan

Second Week

Theory of Gasoline Engines

1. Explosive mixtures (gasoline vapors and air)
2. Effects of explosion
   - *a*) Heat
   - *b*) Expansion
     - (1) Results of expansion: (boiler explosions, mine explosions. Method of utilizing explosions in gasoline engine.)
3. Design of the engine for purposes of generating power from explosion:
   - *a*) Explosion chamber
   - *b*) Spark plug
   - *c*) Valve intake and exhaust
4. Auxiliary devices relating to the engine:
   - *a*) Device for converting the motion of the piston from rectilinear to rotary — connecting rod, crank, and shaft.
   - *b*) Device for forcing piston back into

position for next explosion: flywheel.
c) Device for admitting and expelling gases: valves and cams.
d) Device for mixing gas and air vapor: carburetor.
e) Device for creating a spark: ignition system.
f) Device for removing excessive heat: cooling system.
g) Device for lubricating moving parts: lubrication system, oil grooves, etc.

Inspect engine for location of these parts.

Third Week

Four-Cycle Engine

1. The four cycles (four strokes — 2 revolutions)
a) Suction — downstroke
b) Compression — upstroke
c) Explosion — downstroke
d) Exhaust — upstroke

Two-Cycle Engine

1. Comparison of strokes and movable parts.
2. Reason for compression — result of "loss of compression" — loss of power.
3. Position of valves — examine engine for valve position in relation to piston travel.
4. Fill in the following blank spaces with the words *Open* or *Closed*.

Stroke	*Intake Valve*	*Exhaust Valve*
1. Stroke	_____	_____
2. Compression	_____	_____
3. Explosion	_____	_____
4. Exhaust	_____	_____

Operation of Valves

Inspect camshaft and relation of cam to crankshaft. Count number of revolutions of each. Method of speed reduction from crankshaft to camshaft.

Fourth Week

Multiple-cylinder 4-cycle engine

Relation of strokes in various cylinders in:
4-cylinder engine
6-cylinder engine
8-cylinder engine

Types of crankshafts for various types. Reasons for arrangements.

Possible and impossible arrangements.

"Firing order" and in 4- and 6-cylinder engines.

Fifth Week

The clutch — purpose and position
Types

The Transmission — reason for gear shift

Theory of gearing:

Relation of size of gear to speed and power.

Examine transmission and count revolutions.

1st speed——, 2nd speed——, 3rd speed——, reverse——.

Calculate the power ratios.
Reasons for starting in first.
Reasons for shifting to second on hill.
Diagram of gear arrangement.

Sixth Week

Universal joints
Purpose; location; construction
Types
Drive shaft and rear end

Inspection of these parts

The differential
Location; purpose; method of construction and operation
(Impress the fact that each wheel is mounted on a separate shaft.)

Wheels and brakes
Method of wheel mounting
Types of wheels
Live axle
Semi- and full-floating axle
Location of foot and emergency brakes
"Equalizing brakes"
Method and importance of brakes

Steering gear
Parts
Location
Method of operation

Seventh Week

The carburetor
Location; purpose
Essential parts (from model and diagram)
Adjustments and results
Lean mixtures vs. rich mixtures
Use of the throttle; the choke
Purpose of the accelerator

Details of Construction

Eighth Week

Details of Construction

The ignition system

Theory of generating of electrical current:
1. Chemical — battery
2. Mechanical — generator and magneto

(Reversing process produces motion in starting motor)

Theory of the generator
Parts: pole pieces; armature; brushes; commutator; cut-out
Direct and alternating current

Theory of the battery
Construction (from model and diagram)
Chemical action
Solution used
Discharging and charging batteries
Battery voltage
Method of raising the voltage — induction coil

Ninth Week

Details of Construction

Ignition system, continued

Magneto and generator
Starter
Voltage of current and method of raising the voltage (induction coil).
The make and break current (interruption or vibration method).
Distribution for sending current to various spark plugs.

Lighting system
Headlight regulation
Method of dimming
Glass

Tenth Week

The cooling system: air; water
Parts
Water jacket
Radiator
Pump
Thermostat
Fan
Temperature gauge

The lubrication system
Importance of lubrication
Results of failure
Tests for lubricating oil
Methods of distribution:
Splash
Force pump, etc.
Combination splash and pump
High pressure

Eleventh Week

Automobile troubles and remedies

Twelfth to Nineteenth Weeks

Assignments and Exercises

Method of conducting exercises

Divide the class into squads of three. Give each boy a detailed statement of all assignments. Post a schedule giving the order of assignments for each squad. Whenever an assignment is completed, a written report must be submitted to the instructor who then assigns a grade for the work.

COURSE II

First Week

Review parts of automobile, location, and functions

1. Power plant and accessories:
Engine — Crankshaft
Valve — Camshaft
Carburetor
2. Transmission system:
Clutch — Drive system
Transmission — Differential
Universal joint
3. Cooling system:
Thermostat — Pumps
Radiator — Water jackets, etc.
4. Lubrication systems:
Pumps, etc.
5. Electric system:
Battery — Induction coil
Starting motor — Distributor
Generator — Lighting system, etc
Magneto
6. Miscellaneous:
Frame construction — Brake system, etc.
Body construction — Accessories
Steering gear

Second Week

Principles of mechanics applied to automobile design

1. The force X distance principle.
As illustrated by the law of levers, pulleys, etc.
Applied to speed and distance in system of gear combination in the transmission, in work drives, etc.
2. Principles of inertia and momentum.
Applied to force required to:
1. Start a car.
2. Continue it in motion.
3. Retard in motion.

Third Week

Third Principle: Principle of friction

Friction in the clutch — method of increasing
Friction in the brakes
Friction in traction (reasons for skidding)
Friction in the cylinders
Friction in the bearings
Friction in other moving parts
Necessity for lubrication

Fourth Week

Principles of pressure and vacuum

1. As applied to intake, compression.
Expansion after firing and exhaust.
A diagram of cylinder pressure is to be prepared—(indicate diagrams).
2. As applied to gasoline supply system, vacuum tank, etc.
3. As applied to force-feed lubrication.
4. As applied to the carburetor.

Fifth Week

Principles of heat as applied to the automobile

Heat of combustion.
Heat of friction.
Effects of heat upon moving parts, i.e., piston and cylinder bearings.
Methods of reducing heat:

1. Cooling systems.
2. Lubricating systems.

Sixth Week

Principles of chemistry
- Principles of chemistry involved in the mixing and in the combustion of gas vapor and air.
- Reason for carbon formation.
- Methods of "burning out" carbon.

Principles of chemistry involved in the storage batteries
- Charging and discharging.
- Reasons for the failure of a storage battery.
- Methods of preventing failure.
- Methods of repairing.

Principles of electricity applied to the automobile
- Generating of current by chemical action; dry cell; storage battery; etc.
- Meaning of: voltage; amperage; resistance; circuit; parallel; series; etc.
- Use of storage battery circuit in lighting.
- Grounded circuits.

Seventh Week

Generating of current by mechanical action
- Principle of magnetism.
- Permanent and temporary magnets.
- The electromagnet.
- Effects of rotating a coil in a magnetic field.
- Direction of current.
- Effects of sending a current through a coil in a magnetic field:
- Direction of motion.
- Use of these principles in the design of generator and motor.

Eighth Week

Alternating and direct current generators
- Differences in construction.
- Differences in the resulting current.
- Meaning of: pole pieces, armature, commutator, brushes, etc.

Ninth Week

Principles of induction as applied to the automobile
- Method of inducing a current in a coil of wire.
- Voltage of primary and secondary circuit.
- The induction coil:
  - Essential parts: primary coil, core, vibrator of make and break
- Control of voltage.
- Meaning of high tension and low tension.
- Necessity for high-tension current for the spark plug.

Tenth Week

Method of distributing current in the automobile
- Design of distributor for four-, six-, and eight-cylinder cars.
- Design of spark plug "firing order."

Review

Eleventh to Nineteenth Weeks
Dismantling of Motor

Operations
1. Remove starter generator.
2. Remove ignition unit.
3. Remove carburetor.
4. Remove manifolds.
5. Remove water pump.
6. Remove transmission.
7. Remove cylinder head.
8. Remove crankcase.
9. Remove pistons (mark them).
10. Remove valves (mark them). (Put all bolts back in place where possible. Clean all parts thoroughly.)
11. Clean out carburetor.
12. Dismantle and overhaul generator-starter unit.
13. Dismantle and overhaul ignition unit.
14. Dismantle and overhaul water pump.
15. Dismantle, clean, and overhaul oil pump.
16. If new pistons are used, lap them in, using 1 special and 2 plain rings. If old pistons are used, use 2 special and 1 plain ring. (Lap joint preferred.)
17. Fit main bearings.
18. Fit connecting rods.
19. Overhaul transmission and universal joints.

Aspects of National Avocationalism

Max Chambers

Public Schools,
Federalsburg, Maryland

This is the first of a series of timely articles on the vital question of hobbies.

NOTHING in this great period of transition has so forcefully come home as has the question of the proper distribution of our time. How shall we use it to the best advantage to ourselves and country?

No better answer can be found than that expressed in the old word derived from the ambling Irish Pony — the Hobby. It recalls the pleasant diversion of wandering in other fields, or as Emily Dickinson once wrote: "There is no frigate like a book to take us lands away." A hobby takes our minds away from the cares of idleness and the days of toil. Call it what you will — catharsis, avocation, escape, creation, relief, relaxation, or hobby — it has the same meaning in all languages — outlet.

There is nothing new about having a hobby, for the great men of all ages have had time for a favorite diversion. The wise Solomon had time for it, the Greeks had a word for it, and today the men of all nations find peace of mind in their stamp collections. Japan flies her kites, France collects her tin soldiers, and we are building a new and greater America on the backs of our enthusiastic hobby riders.

Humanitarians up and down the length and breadth of the land have worked, tirelessly and in good faith, trying to redirect derelicts — after they have slipped. Daniel Boone won the Revolutionary War by "redirecting" the Indians. One of the smartest redirection moves ever made by any man in the political or economic history of the world was made by President Roosevelt when he established the Civilian Conservation Corps which literally took out of circulation and put into a satisfying and stimulating activity 300,000 pieces of dangerously susceptible, potential, destructive, and revolutionary explosives. No one realizes the importance of this question more than does our President. "Teach a boy to blow a horn and he won't blow a safe," is the slogan of the National Music Dealers' Association. It is another citation of the consciousness of our need for proper guidance in spare-time activities.

The board of directors of the National Recreation Association reveals a list of Americans whose names are household by-words. They are constantly striving through recreational activities to direct our boys and girls, men and women, into fields of diversion that are healthful as well as satisfying. Probably the outstanding civic example of concentrated effort to make people hobby-conscious is the Santa Barbara Recreation Center, itself the outcome of a woman's hobby. Ten thousand people a month find the happiness at this place "For all people!" It is twenty years old and going strong. *Viva Santa Barbara!*

The present depression doubtless has done some good. At least men who had never before had time on their hands found that nerves could easily be restrung with a hobby and from their efforts have come nation-wide club movements which are now well under way. The Home Workshop Guild started at Rockford, Illinois, is spreading at a fast pace. There is a busy executive in Baltimore whose basement workshop is a source of never-ending pleasure. One night a week the neighborhood scout troop makes his shop their meeting place. He is a man with vision, building aptitudes and character which we shall so badly need tomorrow. Famous surgeons need steely nerves and steady hands for delicate work — products derived from their home workshops.

From meager beginnings by a few boys and fewer far-sighted men, local competitions have sprung up all over the country. In most places the event is called the "Hobby Fair" and in some places the hobby fair has grown into a com-

munity fair with almost every person in the community participating — Federalsburg is an outstanding example. No other plan seems to afford such an opportunity for self-expression and personality emergence.

All teachers know that to keep students out of trouble they must be constantly employed, but most of the employment is on assigned work and little of it on volunteer work. The truth is that few students know how to take the initiative because they have been trained to take assignments and to follow. Why shouldn't a part of their work be voluntary? Why shouldn't they get credit for making a special study and collection of some particular subject? The hobby plan is a 100 per cent volunteer movement because you cannot make a boy have a hobby. The President cannot make the people have hobbies, but he can and is setting up a fine precedent in his own hobbies of swimming, and collecting stamps and naval prints.

When Americans cannot lead they are the world's finest followers. Today they are following through on this great offensive and building into their lives beautiful and lasting avocations and a stronger love for the greatest of all ambitions — peace of mind.

Wood Carving—IV

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Director of Industrial Arts, Miami, Florida

This is the fourth article in a series describing the art of wood carving for industrial-arts students.

THE significance of the wise use of leisure is being understood more and more, and schools will have to give increasing attention to education for its proper use. One's working hours are organized and planned, but leisure time is choosing time. Industrial arts by its very nature is well adapted to stimulate interests in things that may be well carried over into hobbies which will provide profitable and useful occupations for leisure. We cannot continue to neglect this side of industrial-arts work in the schools. Indeed, independent of any planned procedure, home and leisure-time arts and crafts work already has attracted a large and constantly growing group of enthusiastic dilettantes.

Wood carving is an ideal leisure-time hobby. It is easy enough in some of its forms for the beginner, and it is difficult enough that no matter what progress one makes, there always remains some new and better work to be attained as the worker is able to carry his work into the realm of the fine arts. Wood carving, if properly carried out, is never an end in itself, but is always a part of something of use or beauty, making its own contribution to the art expressed in the common objects by which we are surrounded.

Wood carving is the return of an old art in a new age. Traditions handed down through countless generations have been upset in the brief space of the past century. Before the coming of the Industrial Revolution, articles of daily use were produced by the slow hand process. The craftsman often also was the designer. Since his work progressed but slowly, he had time to absorb the traditions of the best in his craft. New decorative motifs made their way gradually into the currently accepted forms and were handed

Fig. 16. Designs for use in level surface carving

down from one generation to the next. In this way grew up period styles, and types of work peculiar to certain countries and presenting rather definite historical backgrounds.

Mass production by machinery upset much of this fine tradition. Gradually designs changed from the hand-made products. New forms came in and new designers. Demand for increased production continued to debase standards of workmanship, and so the reaction went on in a continual lowering of the circle until about the Rutherford B. Hays period of American life, articles of daily use reached a level of ugliness never before known. In the past few years there is apparent a distinct movement for better and more artistic designs.

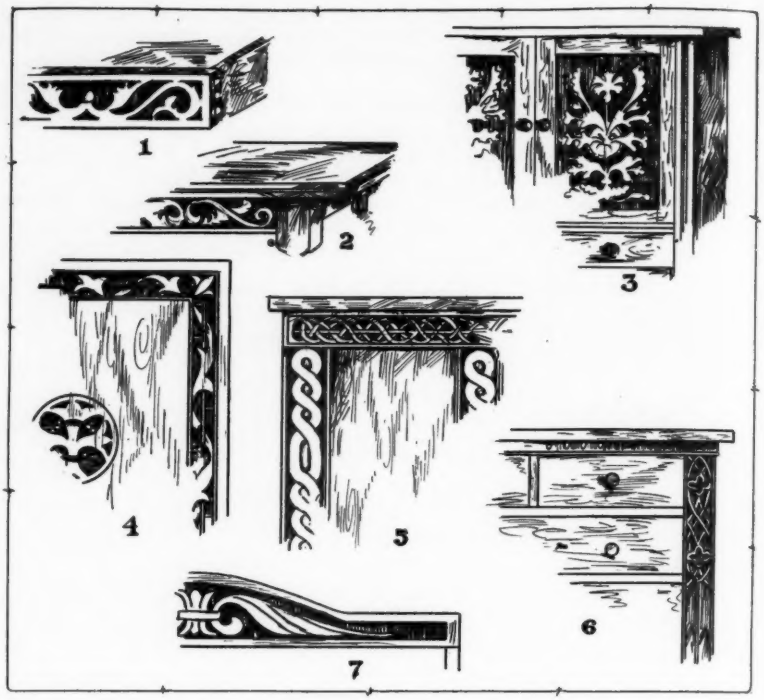

Fig. 17. Showing some applications of designs to actual work, as taken from Fig. 16

Level-Surface Carving

In this article on methods of wood carving, we shall take up *level-surface* work. In Part III of this series the form of carving described was largely executed with the gouge, the pattern of which depended upon the hollows and grooves that had to be cut *below* the surface of the wood. In the present article the work is executed in exactly the opposite manner; that is, the design is on the surface of the wood, and the background is cut down. In this way, very much more artistic results may be obtained, and one has a wider range of designs, and of practical applications.

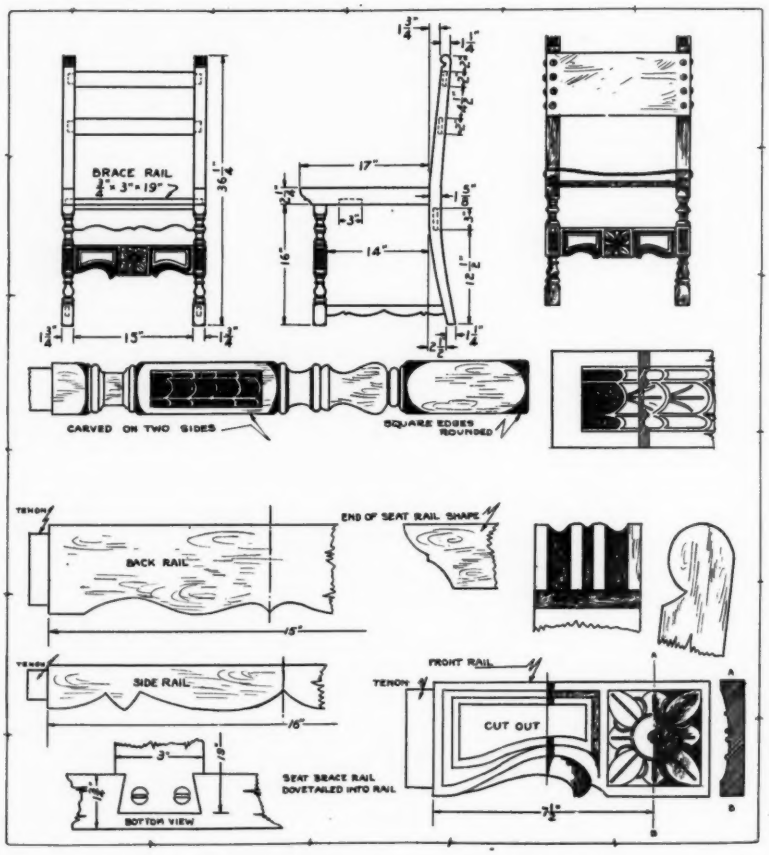

Fig. 18. A Spanish Renaissance chair detail drawing

Figure 16 shows a number of these designs. It will be noted that the design is laid out on the surface of the piece to be carved. It is then outlined with a V-tool, or a small gouge, after which the background is cut away to a depth of little more than a sixteenth of an inch. If the cutting in the background is left with some roughness and tool marks, a better effect is produced than if an attempt is made to work it out too smoothly. In no case should the background be done over with a punch, which is so common in machine carving.

No carver of real ability ever resorts to the use of a punch for this purpose, and it is just as well to keep away from this right from the beginning.

The beauty of level-surface carving depends upon the grace and adaptability of the designs. These may be almost endless. Some are based upon repetition of geometrical figures, others are conventionalized natural forms. Use of the lotus flower, acanthus, and the oak

Fig. 19. Spanish Renaissance chair

leaf are common as motifs in carving designs. Designs in themselves have an interesting history, and furnish a fascinating study. The key to the historic period in which a piece was produced is often found in the design. The designs shown in Figure 16 afford a wide variety of choice, and may be changed and adjusted to fit the space to be carved.

Figure 17 gives some suggestions as to how these designs may be applied to the work. They have all been taken from those shown in Figure 16.

Spanish-Chair Project

The only way to learn carving is to actually do it. It is best to select a piece of work of real excellence, beauty, and use. With this in mind, the Spanish Renaissance chair shown in Figures 18 and 19 is presented. Instructions for doing all the different kinds of carving represented in this chair are contained in this and previous articles. The carving shown on the front and sides of the legs is the Byzantine shell pattern. It is of Mohammedan origin and is much used in furniture of this type. Practice carving on scrap wood before attempting it on the chair.

Spanish chairs were never upholstered in the sense

Fig. 20. A junior-high-school boy carving

of being *stuffed*. In this chair, for instance, a piece of heavy cowhide is used for the seat and back. Figure 19 shows how to fasten the leather of which the back and seat is made. The seat, it will be noted, is stretched hammocklike between the two side rails. Brass nails with large heads are used to secure the leather, giving a very ornamental effect.

This chair is designed for use as a dining chair. It should be made in white oak and stained Spanish brown. Spanish furniture is not varnished, it is stained, given a *very thin* wash coat of shellac, and waxed. No filler is used. Rottenstone is often dusted into the grain of the wood, or washed in with the shellac coat, to give the appearance of age.

Figure 20 shows a junior-high-school pupil at actual work on a piece of carving. He is 14 years old, and is in the 9-B grade. He is carving a modeled pattern on a piece belonging to a hall bench. The position of his hands shows that the carver must learn to work from one position, and not form the habit of walking around his work, or changing its position. He must learn how to do his carving in any direction and not expect to work with a forward stroke at all times.

DESIGNING

To design is to give tangible and definite expression to an idea. The term *design* implies an interesting, possibly a beautiful, at least an orderly, rendering of this expression. It may seem superfluous to say that we must first have an idea! Yet it is the very paucity of ideas, the lack of imagination, that forms the first stumblingblock in the path which leads into our subject. In this age of acute specialization, we are so dependent upon others for the things which we gather about us in daily life that few of us know the joy of *creative work*, of planning, building, completing things. Where, indeed, can one who uses no tools, practices no craft, attempts no creative work, expect to evolve ideas or find a stimulus to the imagination? — *Batchelder.*

LIFE, LABOR, ART

Life without labor is a crime. Labor without art and the amenities of life is brutality. — *Ruskin.*

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

Shop Safety

The 1933 edition of *Accident Facts,* issued by the National Safety Council, shows that accidents resulting in injury and death occur much less frequently to students while engaged in school activities including athletics, than while occupied in nonschool activities. This information is evident from a study of reports which cover 544,000 pupils ranging from the kindergarten through the high school. Emphasis on preventive measures and first-aid treatment in athletics and other school activities has shown very gratifying results. The statistics gathered by the National Safety Council, however, indicate that the school must also emphasize to a greater extent, safety principles and the study of first-aid application for out-of-school activities.

A compilation, made by Bauer & Black from the National Safety Council figures, which covers only the high-school grades, where organized athletics usually begin, shows 278 accidents in athletics, 250 in the gymnasium, and 46 about the swimming pool, making a total of 574 accidents under supervised conditions. During the same school months, 492 high-school students were injured at home, 125 on their way to or from school, 52 in independent activities on the school grounds, and 452 in other places away from school, making a total of 1,121.

Of course, the accidents that occurred outside of school supervision, also mean loss of school attendance and reduced student efficiency. The fact that the supervised activities show less accidents than those that were unsupervised demonstrates that the efforts of the school in inculcating safe practices are effective.

This should be remembered especially in the school shop. Not only should the school shop be made safe, but the future industrial worker also should be trained in habits of thinking safety and practicing safety. Many school-shop teachers take this part of their instruction very seriously, but there are some, especially in woodworking shops, where hand tools only are used, who frequently overlook the possibility of making safety instruction a vital part of their school program.

The shop teacher will find that while stressing shop safety, he also will have many opportunities of inculcating rules of general safety. The results obtained from this will repay all the efforts which he has made in adding this form of instructional material to his outline of instruction.

As a matter of fact, the safety practices should be more than simply implied in the list of *what the student should be able to do* and *what the student should know* in making out the instructional outline. It is just as necessary to know how to perform a tool operation safely as it is to perform it skillfully. It might be argued that skillful mechanics must of necessity be safe mechanics, but for instructional purposes better results will be achieved if the concept of safety is consciously incorporated in every phase of shop instruction, so that the student acquires safety habits, not as a by-product, but as one of the essential parts of his industrial-arts or vocational schoolwork.

The Much-Maligned Individual Instruction Sheet

Various men have adversely criticized individual instruction sheets by saying that this type of instructional material:

1. Changes the teacher into a clerk who does nothing but hand out instructional material to the pupils;
2. Severs the contact between teacher and pupil;
3. Permits the teacher to carry on work extraneous to the teaching schedule (reading newspapers and magazines) at his desk;
4. Makes a jumping-jack out of the teacher who has to help hither and yon in order to keep track of the work that is to be done;
5. Displaces good textbooks by mediocre instruction sheets;
6. Introduces the correspondence-school method into the classroom;
7. Makes a farce out of real teaching;
8. Reduces the teacher's job to the drudgery of writing, revising, and devising new lesson sheets and checking and evaluating those that are in use;
9. Makes it possible to replace a good teacher who has fully organized his work, and has prepared all of his instruction sheets, progress charts, and the like, with a lower-priced individual who does not have to be a teacher at all.

It may be well to consider these statements calmly and dispassionately, to see whether they contain any truth. Some of them, of course, as is apparent, are contradictory.

A teacher who thoroughly understands the use of the individual instruction sheet will never use that method of teaching to the exclusion of other methods. He will use the individual instruction sheet as a means to an end, and only as one of the means to that end, and never look upon it as an end in itself. The idea that he is merely a clerk who hands out instructional material will never occur to him because he will be so busy achieving the greater efficiency which the individual instruction material permits, that he will not allow the detail of handing out instructional material to take up any part of his valuable time. In other words, the dispensing of the individual instruction sheet, in a properly organized school shop, goes hand in hand with other details of self-directed pupil activity so that the teacher has nothing to do with that particular item.

The teacher who has had foresight enough to prepare

individual instruction material for all of his students, will find that he has never had more direct contact with his pupils. As a matter of fact, the individual instruction sheet, if properly constructed, will free the teacher of many of the details which, under the old method of instruction, unnecessarily used up his energy. He, therefore, has more time to devote to the individual needs of his pupils. He will find, too, that he has very little time to spend at his desk and that while the old method of instruction did not permit the reading of newspapers and magazines during class hours, there is even less chance for the conscientious instructor to spend his time in diversions while a live class, using the individual instruction sheet method, is in session.

He might admit that this type of instruction — used as it should be, conjointly with group instruction, class demonstrations, and general discussions — does make him resemble a jumping-jack in his efforts to take care of a greater number of pupils in a more conscientious and more thorough manner than he has ever done before, but that this extra activity is not nearly so tiring and nerve-wracking as the old method would be under the conditions imposed by the increased classes with which the shop teacher in this day and age must contend.

The shop teacher who has properly prepared good individual instructional material, will also disabuse his critics of the idea that the individual instruction sheet usually represents mediocre material and that it displaces good textbooks. The hard-pressed shop teacher frequently recognizes and readily admits his shortcomings as a textbook author. He knows that many of the books now on the market contain exactly the type of material that he wants to use in his classroom. He is not adverse, therefore, to make use of these textbooks in his classes. As a matter of fact, he is in favor of the textbook, but he is not in favor of using it in the trite, old way of assigning so many pages, or a certain number of chapters, for the next lesson, as is customary in many of the ordinary school subjects. Instead, he makes the use of the textbook much more flexible. In the assignment section of his individual instruction sheet, he refers to different pages, paragraphs, or sections of the textbook, and in that way relates it to the immediate job which confronts the pupil. The progressive teacher also knows that the proper type of textbook will relieve him of much of the tediousness of preparing individual instruction sheets. He has found out that by the usual duplicating methods at his command, he can never hope to have the illustrations with which up-to-date textbooks are replete, and yet he knows that he can put his own individual touch to the textbook that has been adopted, by adding the things which he individually thinks are important and ought to be added. In the same manner, use is made of reference books found on the shelves of the shop library.

Such an instructor is not visibly perturbed when confronted with the argument that he uses the correspondence-school method in his shop or classroom. If the correspondence-school method has any good in its favor, he wants to make use of that good just as he is intent on making the best use of what the lecture method, the demonstration method, or any other method may possess. He will strive to do his best to combine all of these methods with the individual instruction sheet in order to give his students the most efficient educational service in the school shop.

He will meet the criticisms that the individual instruction sheet makes a farce out of real teaching with a smile, show what he has accomplished by the use of this derided teaching method, explain frankly whatever shortcomings it may possess, discuss how these shortcomings may be overcome, and then produce some of the work that his students have accomplished. If he makes use of standardized and informal tests in his shopwork, and usually the up-and-coming shop teacher who uses individual instruction sheets is enterprising enough not to overlook the great value of these types of tests, he will show what he has found out about his class, and then calmly ask the critic whether better results have been obtained in classes and shops where the individual instruction sheet method is not used.

He will also admit that the teacher who wants to do a real job with the individual instruction sheet must devote quite a bit of time to its writing, revision, and the like, but that the management details, when once worked out, take care of themselves and that good organization has relegated much of the tedious checking of tests and examinations into the realm of worthwhile student participation. In other words, that while the individual instruction sheet method has not reduced the amount of work that the teacher has to do, yet it has made it very much less nerve-wracking.

He will also remind the critic that the old bugbear of the carefully guarded trade secret has long been done away with in industry, and that there is no good reason why it should be perpetuated in the school shop. For this reason, the energetic shop teacher who has prepared individual instruction material for his own work, is anxious to compare notes with other teachers who are equally enterprising. In other words, while he may not be willing to hand out his instruction sheets broadcast to every Tom, Dick, and Harry who comes along and asks for a set, nevertheless he is always willing on an even-exchange basis to find out what the other progressive man is doing in his shop, and he is not unwilling to profit by anything he can learn from others.

The individual instruction sheet, if properly used, will be an aid to the student and to the teacher. Of course, if not properly used, it will be as inefficient as some of the shop teaching has been in the past in spite of the then prevalent smaller classes, good textbooks, and good shop equipment.

Printing Education

John Backus

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The method chosen by the author in graphically showing what printing contributes to general education might well be used as a model by the teachers of other shop subjects.

SOCIAL and educational surveys of recent years will determine, to a great extent, the educational policies of the public school of tomorrow. The complex problems of our rapidly changing civilization require that our educational leaders develop and organize an educational program especially designed to prepare our youth for this new order. School subjects and methods will be given new values as they justify their place in the organization of the new school. Many of the traditional values will no longer hold the commanding position which they have held in our educational program of the past.

The new education is concerned primarily with the present-day problems of living. Living is purposeful activity and, therefore, the new school program must radiate from the chosen life problem through activity units. Furthermore, the rapidly changing living conditions of today, require that greater emphasis be placed on the attainment and development of certain personal habits and abilities. Creative ability, adaptability, and initiative, along with such habits as accuracy, neatness, concentration and observation, are all essential in the attainment of social and industrial success. Habits and abilities, whether they be mental or physical, are cultivated through frequent repetition of performance. The new school will be the laboratory school with its program organized around purposeful creative activities.

The social and educational chart is a graphical illustration of the place that the printing laboratory will have in this newly organized activity school. The outer circle in this chart includes the seven cardinal aims of education as specified by the National Education Association. To these seven aims have been added two others, self-confidence and creative ability. This represents the generally accepted aims of education in our new school program. The inner circle represents one of the activity units in the laboratory school, the printing laboratory. The inner ring of circles represents the major operations in this activity; the outer ring of circles, the academic and social values growing out of these major operations and which, in turn, lead into the general aims of education as shown in the outer ring.

Printing, with its wide variety of major operations (inner ring of circles), provides for many types of individual differences. For example: Presswork will appeal to the mechanical-minded pupil, while editorial work, proofreading, and composition will interest the literary-minded. The artistic type of pupil will find special interest in the illustrating, typography, and layout work, while the organization and management of the school paper will require and develop certain leadership qualities. In other words, the printing laboratory with its wide variety of major activities, is rich in mechanical, artistic, literary, social, and informational values, all of which are vital to worth-while living.

Industrial Arts Laboratory of Printing

Social and Educational Objectives Chart

CREATIVE ABILITY - VOCATIONAL & SOCIAL GUIDANCE - FUNDAMENTALS - DISCIPLINE - WORTHY CITIZENSHIP - ETHICAL CHARACTER HABITS - WORTHY USE OF LEISURE - WORTHY HOME MEMBERSHIP - KNOWLEDGE - SELF CONFIDENCE
GENERAL INFORMATIONAL VALUES
APPLIED ENGLISH GRAMMAR PUNCTUATION SPELLING
GUIDANCE AND EXPLORATORY
PREPARATION FOR LEISURE
TYPOGRAPHY
SELF EXPRESSION AND ORIGINALITY
ART CREATIVE DESIGN COLOR
PRESSWORK
THE SCHOOL PRINTING LABORATORY LEARN BY DOING
APPRECIATION OF GOOD PRINTING
LAYOUT
BINDING
ARITHMETIC AND ESTIMATING
PROOF READING
IMPOSITION
PERSONALITY HABITS ACCURACY-NEATNESS COOPERATION
EDITORIAL JOURNALISM
GOOD JUDGEMENT
LEADERSHIP AND INITIATIVE
HISTORY INDUSTRIAL & SOCIAL
PURPOSEFUL AND CREATIVE ACHIEVEMENT

Technical Vocabularies

John T. Shuman

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This is the fourth vocabulary list and is confined to terms used in the woodworking shop.[1]

Terms Used in the Woodworking Shop

ability	air-dried	apron	attachment	baseboard	bench hook
abrasive	alcohol	arc	automatic	batten	bench jointer
abutting	allowance	arris	awl	bead	benzine
accessories	ammonia	arrowhead	backsaw	beaded	bevel
adjust	angle	asphaltum	bamboo	bed	bill of material
adz	apprentice	assemble	banana oil	bedding	birch
			band saw	belt shifter	bit brace
			bare face	bench	black ash

[1]These lists will shortly appear in "Spelling for Trade and Technical Students." The Christopher Publishing House, Boston, Massachusetts.

- bleaching
- bleeding
- blending
- blind mortise-and-tenon joint
- blue print
- board measure
- bolt
  - carriage
  - machine
  - stove
- border
- bore
- boring tools
  - auger bit
  - bradawl
  - car bit
  - dowel bit
  - expansion bit
  - Forstner bit
  - gimlet bit
  - ship auger
  - twist bit
- brace measure
- bracket
- brad
- bradawl
- brazing
- bridging
- brush
- burl
- burnish
- burnisher
- burr
- buttress
- cabinet
- cabinetmaking
- cabinetwork
- calipers
  - inside
  - outside
- carcass
- carpentry
- carve
- carving
- casehardening
- casing
- catches and bolts
  - ball catch
  - door bolt
  - elbow catch
  - flush bolt
  - table catch
- caul
- ceiling joist
- cell
- cement
- center lines
- chalk line
- chamfer
- check
- cheek cuts
- cherry
- chisels
  - butt
  - diamond-point
  - firmer
  - framing
  - mortise
  - parting
  - round-nose
  - skew
  - socket
  - spear-point
  - tang
  - turning
- chucks
- chuck turning
- circular saw
- clamps
  - C clamp
  - column
  - hand screw
  - steel bar
- classification
- claw hammer
- clear
- coarse
- coarse-grained wood
- coat
- coating
- cold chisel
- combination machine
- compass
- concave
- cone pulley
- coniferous
- conifers
- container
- conventions
- convex
- cope
- coping saw
- cord
- cornice
- corrugated fasteners
- countershaft
- countersink
- crimping
- crosscut saw
- cross-grained
- cross-hatching
- cross-lap
- cross section
- cup center
- curl
- cutter head
- cutters
  - beading
  - chamfer
  - fillister
  - fluting
  - Grecian ogee
  - hollow
  - match
  - plow and dado
  - quarter-hollow
  - quarter-round
  - reeding
  - reverse ogee
  - Roman ogee
  - round
- dado
- dadoes
- dead center
- decalcomania
- decorating
- defacement
- design
- dextrin
- diagonals
- dies
- dimension
- disk
- dividers
- door jamb
- dovetail
- dowel
- doweling
- doweling jig
- drawer guide
- drawer rail
- drawing
- drawknife
- drier
- drill
  - automatic
  - hand
  - reciprocating
- drill press
- drip cup
- drop black
- dross
- duplicate
- duster
- dyes
- ebonize
- ebony
- edging
- eggshell gloss
- ellipse
- embellish
- emery
- emery wheel
- enamel
- end-lap joint
- escutcheon
- face mark
- faceplate
- fasteners
- felling
- fiber
- file
- filing
- filler
- fillet
- finger gauging
- finish
- five-ply
- flatting
- folding rule
- foundation
- framing square
- fret
- frieze
- fuming
- fustic
- gable
- gain of hinge
- garnet paper
- gas pliers
- gauges
  - auger bit
  - butt
  - marking
  - mortising
  - panel
  - plane
  - segment
  - slitting
  - wooden mortising
- gauging
- gimlet
- girt
- glue
  - animal
  - blood-albumen
  - casein
  - liquid
  - vegetable
- gluing
- goggles
- gouges
  - *by handles*
    - socket
    - tang
  - *by bevel*
    - inside bevel
    - outside bevel
  - *by shank*
    - bent shank
    - straight shank
  - *by sweep*
    - flat
    - middle
    - regular
  - *by type*
    - firmer
    - paring
- graduation
- grain
- granular
- grinder
- grinding
- grinding wheel
- grindstone
- grooved
- guard
- guide washer
- gumming
- half-lap joint
- half-round file
- hand screw
- hand tools
- hanger
- hardware
  - bolts
  - casters
  - catches
  - escutcheons
  - hinges
  - knobs
  - locks
  - pulls
  - slides
- hardwood
- harmony
- hasp
- hatchet
- haunched mortise-and-tenon joint
- headstock
- heel
- hewing
- hinge parts
  - knuckle
  - leaf
  - pin
- hinges
  - butt, loose-pin
  - chest
  - double-acting
  - fast-joint
  - invisible
- hollow-chisel mortiser
- honing
- ingredient
- inlaid
- inlaying
- inset
- instruments
- interior woodwork
- jamb
- japan drier
- japanning
- jig saw
- job plan
- joinery
- jointer
- joints
  - box
  - butt
  - dado
  - dovetail
  - dowel
  - gain
  - housed
  - lap or halving
  - miter
  - mortise-and-tenon
  - rabbet
  - rule
  - scarf
  - tongue-and-groove
- kerf
- kerosene
- keyhole saw
- kiln-dried
- knot
- kyanize
- lac
- lacquer
- lapping
- lath
- lathe
- lathe bed
- layouts
- line shaft
- linseed oil
- lintel
- live center
- locks
  - chest
  - mortise
  - rim
- log
- logging
- loose pulley
- lubricant
- lumber
- machine
- mallet
- mandrel
- marquetry
- matched
- material
- maul
- milled surface
- millwork
- miter
  - doweled
  - molding
  - nailed
  - slip-feather
  - spline
- miter and try-square
- miter box
- miter gauge
- molding cutter
- monkey wrench
- mortise
- mortiser
- mortising
  - cutters
  - gauge
  - head
  - machine
- motor
- mullion
- muntin
- nail
- nailing
- nail set
- notch
- occupation
- occupational
- ocher
- octagon measure
- offset
- oil
  - kerosene
  - linseed
  - lubricating
  - rubbing
- oil cup
- oilslip
- overhang
- overlay
- oxidation
- paint
- painting
- panel
- paring
- particles
- parting tool
- partition
- pattern
- pedestal
- penetrating
- permanganate
- perspective
- pier
- pigment
- pincers
- pitch
- plain
- plan
- plane (parts)
  - cap screw
  - cutter iron
  - frog
  - gauge
  - handle
  - knob
  - lateral-adjustment screw
  - lever cap

- plane-iron cap
- Y-adjustment screw
- planer
- guards
- knives
- planes
- block
- bullnose
- circular
- core box
- curved rabbet
- dado
- dovetail
- fillister
- fore
- jack
- jointer
- matching
- molding
- rabbet
- radius
- router
- scraper
- smooth
- spokeshave
- universal
- planing
- plank
- plate
- pliers
- plinth
- plumb
- plumb and level
- plumb bob
- pores
- portable machines
- pressure
- prime
- priming
- priming coat
- production
- progress
- projection
- properties
- pumice
- pumice stone
- pusher
- putty
- qualification
- quick-acting vise
- rabbet
- rafter
- pitch
- rise
- run
- table
- rail
- rake
- ratchet brace
- ray
- rebate
- reeding
- relish
- reveal
- ripping
- ripping guide
- riser
- rosette
- rotary veneer cutter
- rottenstone
- rough stock
- round file
- rout
- router
- routing cutters
- rung
- S2S
- saber blade
- sander
- belt
- disk
- drum
- portable
- spindle
- sanding
- sanding pad
- sandpaper
- sapwood
- sawhorse
- saw jointing
- saws
- back
- band
- circular
- compass
- coping
- crosscut
- dovetail
- hack
- hand
- jig
- keyhole
- miter
- swing cut-off
- turning
- saw set
- saw setting
- scaffold
- scale
- scoring
- scraper
- scraping
- screw driver
- screw-driver bit
- scribed
- scriber
- scribing
- scroll
- seasoning
- seat cut
- setting
- shank
- shaper
- shaping
- sharpen
- sheathing
- sheet glue
- shellac
- shellacked
- shingle
- shop drawing
- shoulder
- shrinkage
- side-cutting pliers
- sienna
- sill
- sizing
- sketch
- skew chisel
- skid
- slab
- slasher
- sliding T bevel
- slip
- slip joint
- slipstone
- soak
- spacing
- speed control
- spindle
- spline
- split turning
- spokeshave
- spontaneous combustion
- spur center
- squared
- squareness
- squares
- framing
- miter
- try
- squaring
- stains
- acid (chemical)
- oil
- spirit
- water
- steel square
- stile
- stool
- straightedge
- strapwork carving
- strength
- stretcher
- stringer
- strop
- studding
- surface
- surfacer
- swing cut-off saw
- tail spindle
- tailstock
- tang
- tapered
- tapering
- template
- tenon
- testing
- three-ply
- threshold
- timber
- toeing
- toenail
- tongue
- toolrest
- tools
- cutting
- hand
- machine
- measuring
- tough
- tourniquet
- trammel points
- tread
- trestle
- triangle
- trim
- trimmer
- trowel
- true surface
- try-square
- turpentine
- umber
- variety saw bench
- varnish
- vehicle
- veining
- veneer
- veneering
- vise
- wall board
- warp
- warping
- waste
- wax
- ways
- wedge
- whetstone
- whetting
- wind
- wire-edge
- woods (cabinet)
- ash
- bass
- beech
- bird's-eye maple
- black walnut
- butternut
- cedar
- cherry
- chestnut
- cypress
- Douglas fir
- elm
- Georgia pine
- gum
- mahogany
- maple
- oak
- Oregon pine
- pine
- plain-sawed oak
- plywood
- poplar
- quarter-sawed oak
- red alder
- red cedar
- red gum
- redwood
- rosewood
- spruce
- sugar maple
- sugar pine
- sycamore
- walnut
- white pine
- yellow birch
- yellow pine
- wood structure
- annual rings
- bark
- bast
- cambium
- cortex
- heartwood
- medulla
- medullary rays
- pith
- sapwood
- wood trimmer
- workbench
- working edge
- working face
- wrench
- adjustable
- monkey
- open-end
- zigzag rule

The Industrial Arts on the Air

R. Randolph Karch

Instructor in Printing,
Arsenal Junior High School,
Pittsburgh, Pennsylvania

A short dialog which was broadcast in an effort to inform the public on the value of the subject of printing in the high-school shop.

UNDER present economic conditions, it is imperative that the industrial-arts department take advantage of every opportunity to advertise its work. Many taxpayers, especially those who do not now have children in school, believe that our industrial-arts courses are mere "frills" in education. Very little investigation is made, and much is believed on hearsay. It is a challenge to every industrial-arts teacher to see that the people in his community learn of the value and importance of his work.

When the opportunity presents itself for a school program on the radio, how shall it be done? What should be said, and who should say it? The writer was confronted with these questions when asked to put on a radio program for his school. It was believed that a message from the teacher himself would be too formal to hold the attention of listeners-in. No matter how interesting a speech is to the giver, there are many who consider it quite "dry." The result is that many tune him out — and the message is lost.

After due consideration on the problem, it was decided that

a program put on by the boys would have a better hold on the unseen audience.

Two boys were selected whose voices differed — one high, one low. A skit purporting to be a dialog between a "pupil" and his "father" was then written. The father wishes to know what his boy is studying at school the new semester. The boy tries to tell him in a halting way, and then remembers that he has a booklet, given him by his teacher in industrial arts, that "tells all about it." And so "father" reads the mythical booklet, and the boy backs up its claims, "boy-fashion." Every attempt was made to make the broadcast sound as lifelike as possible. The drama teacher gave aid in training the boys in expression and emphasis.

The thirty-minute program, given over a local radio station, was highly complimented by supervisors in charge. Music by a school chorus provided entertainment before and after the broadcast. The principal of the school introduced the printing instructor, who, after a short talk on the values of printing education, announced the skit, which lasted for twelve minutes.

The following broadcast, in the form of a conversation between father and son, may serve as a model for industrial-arts courses other than printing.

DAD FINDS OUT

Dad: Well, Joe, I've been out of town on the road all week, so I haven't had an opportunity to talk to you about your eighth year at school. Mother tells me you are taking some new courses this year. Tell me all about them.

Joe: Oh, say, Dad, we're taking a course in printing. We get it four periods each week, and it sure is interesting. All the boys like it.

Dad: Printing? Well, what will they think of next! The chances are that you'll never be a printer. Why do they have such a newfangled course in the schools for? When I went to school, all I had was the three R's — readin', 'ritin', and 'rithmetic.

Joe: Oh, you don't understand, Dad. 'Course we all can't be printers, even if we wanted to be. And it isn't newfangled at all — why, they've been teaching printing in junior high schools for almost twenty years, so our teacher said.

Dad: I can see why they teach subjects like woodworking — that course surely made you handy with tools. You fixed that cupboard door last year, and made that dandy footstool for your room. You know a well-made piece of woodwork when you see it, too. But what can a course in printing do for you?

Joe: Well, Dad, printing will make me handy with my hands, too. Gee, to put all those little letters together, and get them right — a fellow has to be good! And printing will help me with my other studies, too.

Dad: Printing will help you with your other work at school? I don't understand!

Joe: Why, I — I just don't know how to tell you, Dad. Oh, yes! Our printing teacher gave us a little booklet to bring home that tells all about it. I almost forgot about it. Now, let's see — I think I put it in my arithmetic book. Yes, here it is. You read it.

Dad: "Printing in the Junior High School. The Value of a Printing Course in Elementary Education." Oh, I see. The Vocational School is to train boys who have decided to take up printing as a trade. You, Joe, are taking industrial arts, or prevocational printing, and not the vocational course. Oh, I thought that they were trying to make a printer out of you!

Joe: Turn over a couple of pages — there. Now read about it.

Dad: It says: "Printing aids in the teaching of the fundamental processes of education through an interesting medium. It helps the pupil to read accurately and understandingly; spell correctly; express himself fluently; and enable him to figure accurately simple arithmetical problems."

Joe: Sure! When we set type we have to get our spelling right. If we leave out a letter, or spell a word wrong, we have to fix it. If we leave out a capital letter or a comma, we have to change that, too, and make it absolutely right. So we fellows try to get all our English right the first time. When we figure how to cut paper we use arithmetic.

Dad: Well, Joe, I hope it does. You fell down a little in your English grammar last year. (*Pause*) I'll read some more: "As the shop is conducted as much like a real commercial printing plant as is possible, it gives the boy a clear understanding of the relationship between the employer and the employee. It stimulates a desire to solve one's own problems, rather than rely on the teacher for aid. Furthermore, it develops resourcefulness, to aid him in meeting with difficult situations; initiative, to instill energy and develop aptitude; responsibility, to teach the pupil to be answerable in the use of tools and machines; inventiveness, to develop ingeniousness in procedures; and good judgment with respect to his contacts and partnerships with his fellow workers."

Joe: Yes, we have regular standard printers' tools to work with: type and presses like a real shop. We have to dig out all our information on printing from the textbook. If we don't understand it, then our teacher helps us.

Dad: It says here: "The printing department provides a vehicle for the worthy use of leisure time, and encourages hobbies, publications, and clubs, such as the Press Club, which teaches journalism, proofreading, and printing processes."

Joe: Dad, I'm our homeroom reporter for the school paper, the *Patriot*. When I get good in printing the teacher is going to let me set my class notes in type for the paper.

Dad: So you got the election as reporter for your homeroom? I'd like to see a copy of that paper, the *Patriot*. Do you have a copy?

Joe: Not for this year, yet. The paper will come out next week. Here's one from last year, though. We got it from the teacher that sponsors the paper to give us an idea how to write news items.

Dad: "*The Arsenal Patriot.*" My, that's a good name. "Printed and published by the pupils of the Arsenal Junior High School." Why, this is a regular little newspaper, and tells all the news of the school. (*Pause*) Here's an article with a big black heading on the first page: "Honor Rating Earned by 70," containing the names of all the boys and girls who were on the honor roll.

Joe: The kids sure like to see their names in the paper. That means a lot Dad, to be on the honor roll. I want to make it this year and get my name in the paper, but I'll have to study hard.

Dad: I see page two is the editorial page. Here is a list of the names of the staff that writes the articles. Do you mean to tell me that those kids at school really get out this paper?

Joe: Sure they do! Every word is written by the pupils. The homeroom reporters write the news, and the editors read over the stuff and make any corrections needed. Then the boys of the ninth grade set the news in type. The make-up boy puts them in the pages where they will fit. Then they put the pages on the big press and print the blank paper.

Dad: That's certainly interesting. Do the pupils buy the paper?

Joe: The paper only costs two cents for each issue. When we buy a semester subscription, we get the paper for less than that. This money buys the paper and ink and pictures and things that the *Patriot* needs. Everybody reads the paper!

Dad: Here's your platform in this editorial entitled: "We make our Debut." It says: "The purposes of the school newspaper are to focus pupil attention on worthy achievements; to create increased interest in all the activities of the school, educational, athletic and social; to develop in pupils habits of observation, thought, and expression; to develop and create loyalty, school spirit, and school patriotism; to foster leadership, initiative, coöperation, and business responsibility; to inform parents, patrons, and friends what the school stands for

and what it accomplishes; to unify the school; to promote the general welfare of the school; and to gain experience in practical journalism." Well, that's some ticket!

Joe: I don't understand much about all that, but the kids like it, I know. We like to read about what our class is doing, and all about what happens in the school. If we save each copy we can bind them at the end of the year and have a real history book of the school. I'm saving all mine.

Dad: Sports page, too? Here's an article on the members that passed the life-saving test in the swimming pool. And the boys who won soccer letters. I see you dropped a meet to Latimer Junior High last year. This paper covers all the news of the school, doesn't it?

Joe: It sure does, Dad. I hope to be on the regular staff next year.

Dad: Well, let's turn back to the little booklet on the printing course at your school.

This is interesting: It says: "Printing in the junior high school develops a fine coördination between eye, hand, and brain, and a keen sense and appreciation for form, color, design, and arrangement."

Joe: Dad, you ought to see the printing we do — it's hanging on the bulletin board in the printshop. Is it pretty! Colors and everything! The older boys print what they call projects. Each boy brings in something he wants to print, and the teacher helps him plan it or make a layout. A layout is like a blue print, you know. Then the boy sets up all the type and prints it on the press — and does all the work by himself! The printing club made calendars last year, and printed a picture in four colors, just like the big magazines! The four colors made a lot more colors, 'cause some were printed over each other. Now I know how to make all the different colors in the funny paper.

Dad: That's fine. I hope you'll get a chance to do this next year.

Joe: Doesn't the booklet say something about how it will train us to know good printing when we see it?

Dad: Let's see. Yes, here it is: "One of the aims of junior-high-school printing is to train correctly future consumers of printed materials. To teach the value of printing in business and education, the processes involved, and a knowledge and appreciation of good typography."

Joe: I guess almost everybody buys printing at some time or another. It must help the printers out to sell printing to people who know something about it.

Dad: And here's something I never considered before. Listen to this: "Under normal conditions, approximately one million boys and one-half million girls enter the industries of the United States each year. These young people differ greatly in their preparation, intelligence, and aptitudes. They must choose a job in one of 3,000 different selections. Not knowing much about the jobs they enter, they float from job to job, in many cases, trying to find the work they are best fitted for. Statistics prove that less than 26 per cent of these junior workers hold the job of their first choice more than one year. Thus an economic loss is suffered by all concerned as they shift from job to job in trying to find work they can do and like. A loss is suffered by the worker himself as he leaves advanced standing in one job and takes on a new apprenticeship in another. The employer who trains him suffers a loss through the oftentimes rather expensive training period devoted to the junior worker. And last of all, the public itself suffers a tax in the form of increased costs of products and service, indirectly caused by this shifting of labor. So industrial-arts courses in the schools provide exploratory and finding values in which the pupil discovers his interests and aptitudes. This satisfies the vocational aim in modern education."

Well, Joe, after reading that much I can see just what the junior high schools are doing — they are presenting the boys and girls with experiences in basic trades and industries. Experience is the best teacher, after all. When the schools give these experiences to boys, like printing, sheet-metal work, woodwork, machine shop, drafting, electricity, and others, they are helping the boy find a job that he likes and really can do — so that he can either go to a higher school and study it further, or enter the trade immediately as an apprentice.

Joe: Gosh, Dad, out of all those trades I ought to find one that I can do better than the others!

Dad: You certainly should, son. When I was a boy we didn't have these advantages. When I quit school, I floated around from one trade to another for years before I got into my present work. Had I got an idea of what these jobs were like in school, it would have saved me all that time. Joe, do you suppose that I could come over and visit the school some day and see the shops?

Joe: Sure you could! Lots of visitors come in the shop. Come over tomorrow, Dad, and I'll show you my type case and how to set type and print things!

Dad: All right, son. I'll be there tomorrow!

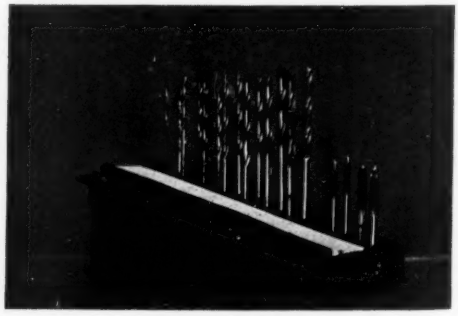
Problems and Projects

A MACHINE-SHOP KINK

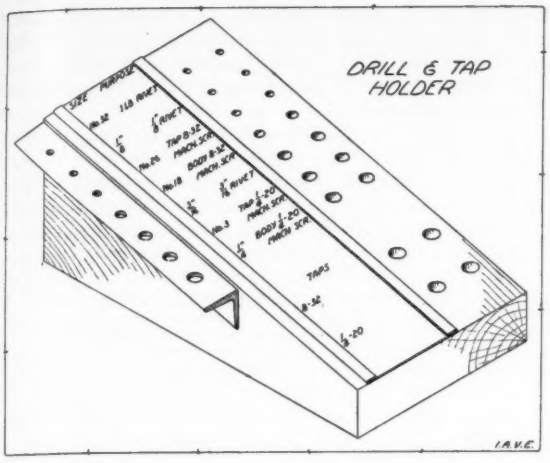
Edmund J. Herd, Roosevelt Junior High School, New Brunswick, New Jersey

The teacher of the general metal shop frequently is faced with the problem of the boy who selects a tap drill which is too small and discovers the error only after the tap has been broken. Equally troublesome is the fact that the school projects chosen, may require a large number of different sizes of machine screws with an accompanying large number of tap and body size drills. To overcome these difficulties, the sizes of machine screws and rivets used in the shop were reduced as much as possible. In this way, the small-sized drills in general use were reduced to seven.

A chart of these seven drill sizes together with their particular uses is attached to the face of the block shown in Figures 1 and 2. Along the edge of the block is fastened a piece of ¾-in. angle iron in which holes of the size indicated on the chart have been drilled. These holes are exactly opposite the corresponding drill size, and take the place of a drill gauge. This device, developed by Mr. Wilton Colman in the metal shop of the Roosevelt Junior High School at New Bruns-



Drill and Tap Holder



wick, N. J., is so simple that the students quickly learn to use it.

The device has resulted in a considerable saving of drills and taps to say nothing of the time of the teacher.

The seven sizes with their accompanying uses as they appear on the chart are: No. 32 drill for 1-lb. tinners' rivet; ⅛-in. iron rivet; No. 26 tap drill for 8-32 machine screw; No. 18 body drill for 8-32 machine screw; 3/16-in. drill for 3/16-in. rivet; No. 3 tap drill for ¼-in-20 machine screw; and ¼-in. body drill for ¼-in.-20 machine screw.

GATE-LEG DESK

Ken. F. Shepardson, La Crosse, Wisconsin

The gate-leg desk, described in this article, is a modification of a design[1] from *Furniture Today and Tomorrow*, by Wm. L. Simons. The changes were made to simplify the project so it might be constructed in the school shop. Even with this modification the problem is a difficult one, and the instructor should permit only the most competent pupil to attempt it.

The top leg hinges can best be made with spikes with a washer between leg and rail to allow clearance. The top rear part of the legs which swing must be somewhat narrower to allow them to swing into position without rubbing. A piece of felt may be glued to the top of the swinging legs to keep the top from being marred. The back side of the swinging rails at the spike joints must be rounded to allow clearance.

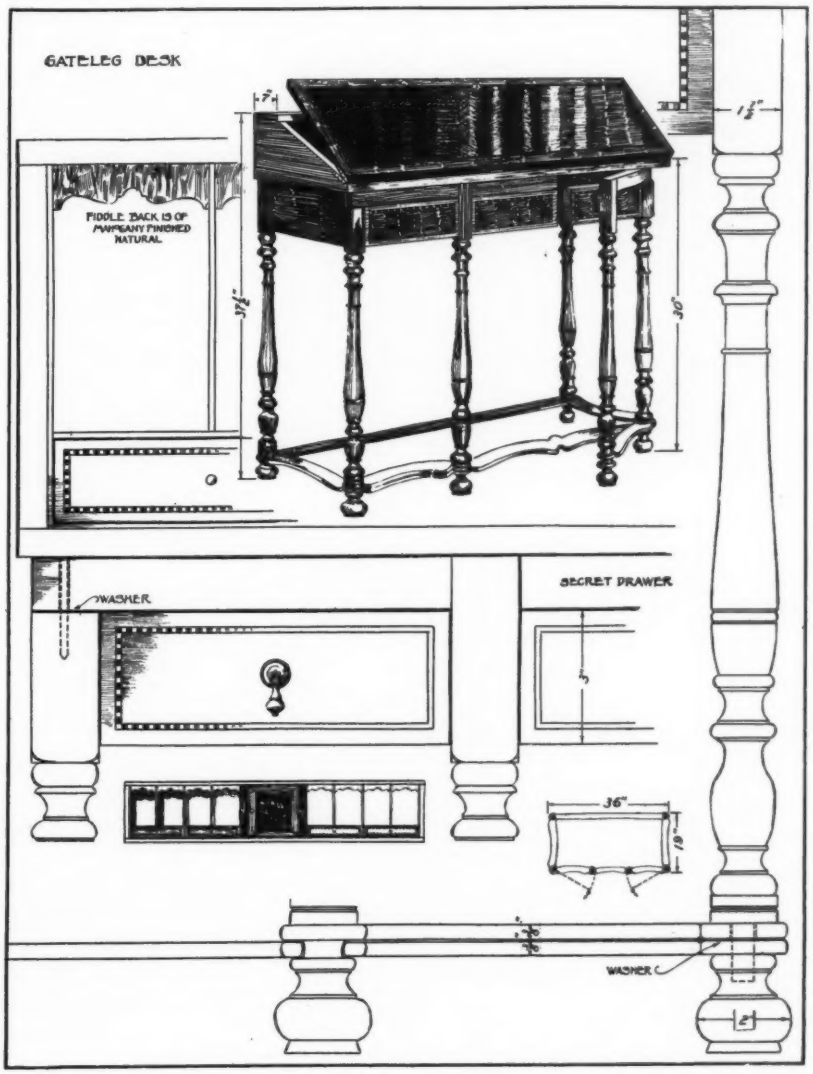
The leg supports are fastened together by corrugated fasteners at the mitered corners. Holes are then bored for the doweled legs. The holes for the doweled swing pieces are made slightly larger. The bun feet are made of a 2-in. stock, 2½ in. high.

The hinged top is bound with mitered pieces of the same thickness as the top. The ends of the top should be grooved to admit the end pieces which are glued in place. Spline reënforcements at the mitered corners will add strength for the joints when the side pieces are glued in place. All of the strips may be glued on at one time, but the above-mentioned way is easier. A strip of inlay is set just inside the border and also in the drawer fronts. The ends of the top part of the desk may be veneered to cover end grain.

A shallow secret drawer can be installed directly above the outside center drawer. The secret drawer front would appear to be a rail and could be pulled out after the drawer below had been drawn out far enough to admit a fingerhold beneath.

The drawers and top are finished in two tones: The dark centers which are the same as the rest of the desk and the outer edges beyond the inlay are finished as light as possible. The fiddle back of mahogany is finished natural.

Walnut is preferred for this job, but gumwood will suit the purpose and is much cheaper. Combining both woods would help to reduce the cost somewhat without decreasing the beauty of the finished desk. For instance, gumwood might be used for the rear legs, ends, stationary top, pigeonholes, and



[1]Modification of the design made with the permission of the Architectural Book Publishing Co., New York City, publishers of *Furniture Today and Tomorrow*.

for other inconspicuous places, and walnut for the front legs, hinged top, etc.

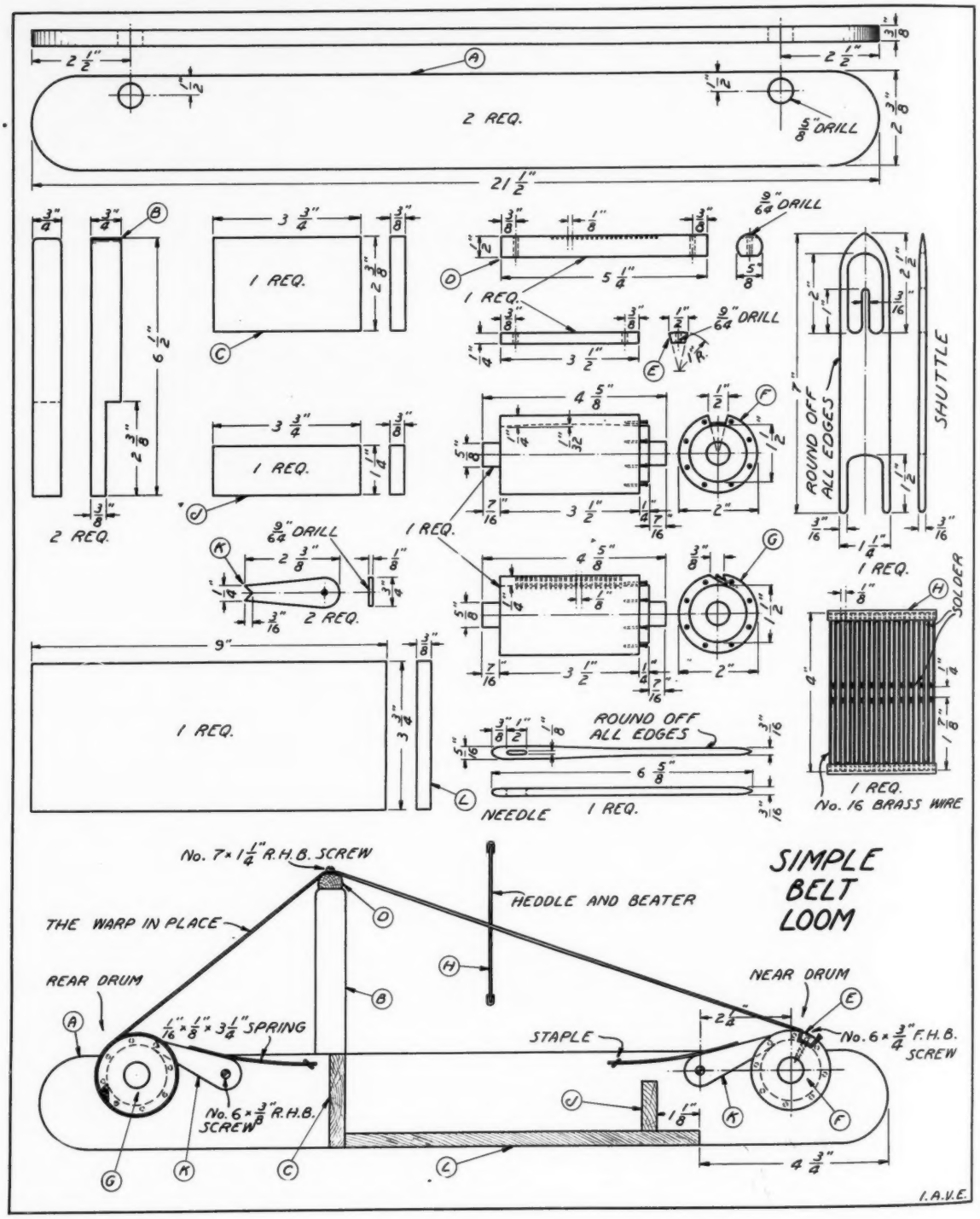
The hardware should match in finish. Dull silver or bronze or brass are very effective.

SIMPLE BELT LOOM

W. Ben Hunt, Hales Corners, Wisconsin

The simple loom illustrated and described herewith may be used for weaving belts or other narrow pieces. It may be constructed in a few hours' time. It embodies the principles of the large loom. The heddle also serves as the beater and spreader. The tension is adjustable, and the finished weaving reeled upon drums just as it is done on a regular loom. The brads in the rear drum and the grooves in the upper crosspiece should be spaced to correspond with the spacing between the heddle wires.

The making of the heddle requires a little explanation. It is made of 16-gauge brass wire. Cut this in 4-in. lengths, clean with emery cloth or steel wool, and lay in a row, with small pieces of the same wire, about ⅛ or ¼ in. long, between them as spacers. Apply flux and lay small pieces of wire solder in place, as shown in the illustration. Then apply heat with



blowpipe. Two pieces of thin brass about ⅜ in. wide and a little longer than the finished heddle are then tinned on one side and bent to form a U channel with the open part just far enough apart to take the ends of the wire. One of these channels is then soldered firmly to the wires on each end of the heddle.

Make an extra shuttle or two for different-colored yarns, and also a wooden needle for use when only one or two strands of color are wanted.

As will be noticed, the bottom of the groove in the rear drum is slightly convex. This is done so that the gripping strip will hold the strands firmly throughout its length.

To thread the loom, cut the number of strands required. Knot each one on the brads on the rear drum, pull over notched crosspiece evenly and then thread through heddle. When this is done, get an even tension on all strands and wind up surplus on *rear* drum. When loose ends are about 3 in. from the *near* drum, loosen one of the screws that hold down the gripping strip, and take out the other. Then pull the warp under the gripper, and fasten the gripper down with the two screws, keeping the tension on the strands even while doing so.

LEARNING HOW TO USE THE MICROMETER

N. L. Apollonio, High School, Sacramento, California

The teaching of micrometer reading may be made easier by having each student, first, construct a paper working model of a micrometer, and second, have him use this model in solving assigned problems.

The model shown in the illustration is drawn on a piece of heavy drawing paper 8½ by 11 in. A pencil, straightedge, scale (engineer's scale is desirable, though not absolutely necessary), and a knife will be required. The micrometer is sketched by the student, as shown in the illustration. The slider shown at the right is made, and slots are cut on the lines XY. The graduations may be made four times actual size to facilitate reading the measurements. The slider graduations may be made three times actual size.

A secondary value in having the student construct this simple model is that he becomes familiar with the names of the various parts of the instrument. Ideas for sketches may be had from various texts and catalogs.

After the paper model has been made, the student is ready to use it in solving problems. These may be presented in various ways.

1. Written numbers to be set by the use of the slides. For instance, the student may be asked to set his micrometer at six hundred and twenty-five thousandths.

Or 2, he may be given the same problem expressed in Arabic numerals, i.e., set the micrometer at .625 in.

Or 3, he may be given a picture of a setting to be duplicated on the model and then read and expressed numerically or in written form.

In constructing the model the student learns that one division on the horizontal slider is 1/40 of an inch or .025 in. Four of these divisions make 4 times .025 or .1 and is marked 1 on the sleeve. The next group of four divisions is marked 2, and so on, up to 10 for the inch micrometer. The thimble, represented by the slider, is divided into 25 equal divisions. Therefore one division equals 1/25 of .025 or .001 in. The final result, of course, is the sum of the horizontal sleeve reading and the vertical slider reading.

After testing the student with problems, he may be given the actual micrometer to use. He should be told:

1. That the micrometer is a delicate instrument and is used where accurate measurements are desired.

2. That the thimble, besides being graduated to assist in the reading of the micrometer, also serves to protect the threads from dust and wear.

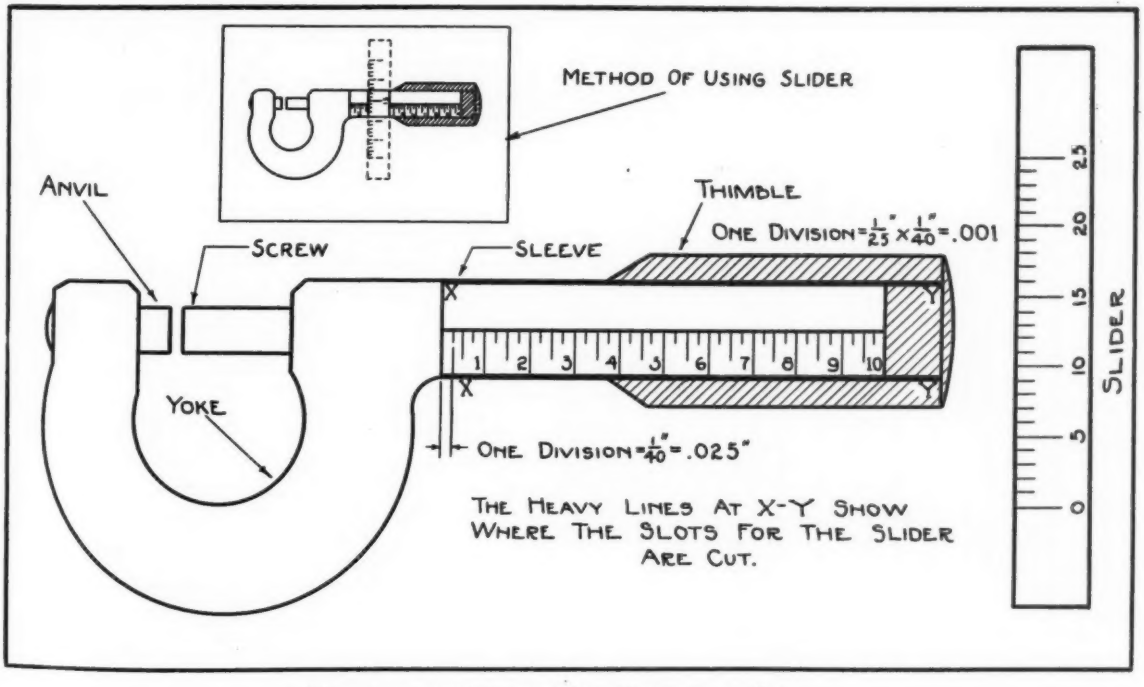
3. That for comparative measurements, the materials and instruments must be at the same temperatures.

A final test, like that suggested by Wm. L. Hunter, page 145, in the April, 1926, issue of the INDUSTRIAL-ARTS MAGAZINE, may be given.

Reference and Texts on the Micrometer

1. "Micrometer Reading Test," Wm. L. Hunter, page 145, April, 1926, issue of INDUSTRIAL-ARTS MAGAZINE, The Bruce Publishing Company, Milwaukee, Wis.

2. "Micrometer Reading Tests" Supplement and page 170,



Micrometer model for teaching micrometer reading

May, 1932, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, The Bruce Publishing Company, Milwaukee, Wis.

3. Starrett Catalog No. 23D, The L. S. Starrett Co., Athol, Mass.

4. *Shop Mathematics,* by E. Holton. Published by The Bruce Publishing Company, Milwaukee, Wis.

5. *Shop Arithmetic,* by Norris and Smith. Published by McGraw-Hill Book Co., New York, N. Y.

6. *Vocational Mathematics,* by Dooley. Published by D. C. Heath & Co., New York, N. Y.

7. *Practical Applied Mathematics,* by J. W. L. Hale. Published by McGraw-Hill Book Co., New York, N. Y.

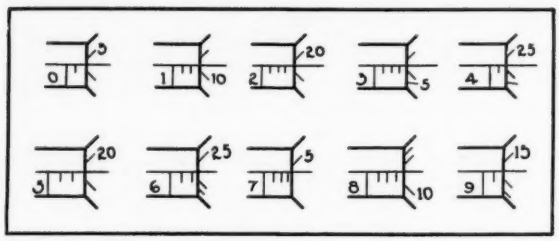
8. *Mathematics for Machinists,* by R. W. Burnham. Published by John Wiley & Sons, New York, N. Y.

Problems to be Solved with the Model Micrometer

I. Set the following readings on the micrometer model, then make sketch:

.023, .145, .287, .315, .456, .594, .672, .714, .830, .952.

II. Set the micrometer model to correspond to the following sketches, then read and write results.



Micrometer problems

THE RESPONSIBILITY-ASSIGNMENT BOARD

R. B. McHenry, Central High School, Tulsa, Oklahoma

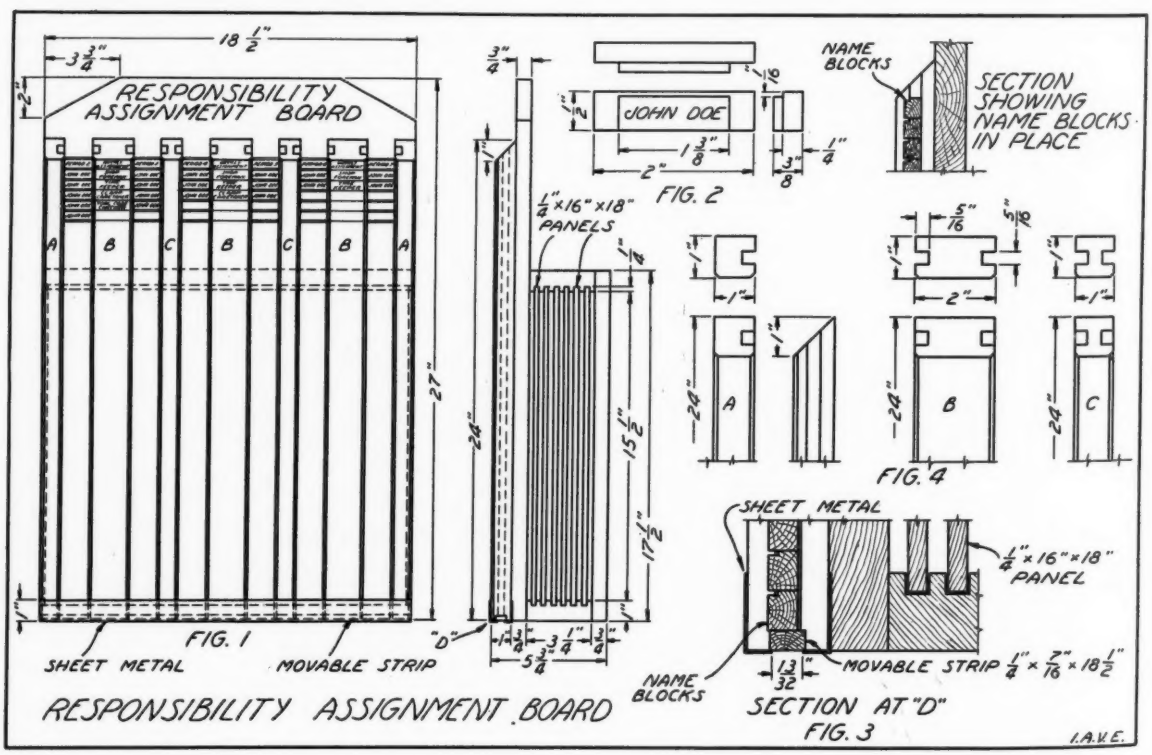
The responsibility-assignment board shown in Figures 1, 2, 3, and 4 was designed to assist in rotating the students through a definite list of assigned responsibilities or obligations toward the upkeep and care of the equipment and materials used in the woodwork shop.

The responsibilities to be filled are: shop foreman, assistant foreman, timekeeper, tool-case checker, jointer caretaker, circular-saw caretaker, band-saw caretaker, desk and desk-tool checker, glue-table caretaker, stain-table caretaker, spray-gun caretaker, lumber and finishing-material checker, instruction sheet and hardware checker, and so forth.

The responsibilities are listed on the board on part B, Figures 1 and 4. These weekly assignments remain in the same location during the entire school year. The students' names are written on the small name blocks shown in Figure 2. These blocks are dropped into the slides between A and B, and between C and B, Figures 1 and 3. The name blocks remain in one location for a week. At the end of the week the lower name block is removed by sliding out the movable strip shown at D, Figure 1. The block that has been removed is dropped in at the top of the slide, forcing each name block into a new location for the coming week, thus assigning new responsibilities to each student. The students are graded on their ability to carry out their responsibilities. The grades are recorded on grade sheets fastened to the sliding panels shown in Figure 1. In this way each boy has an opportunity to check up on himself from time to time.

At the beginning of the new week, when the student is given a new responsibility he immediately desires to know what his obligations will be. In order to eliminate questions, a brief instruction sheet on each weekly assignment has been prepared. These instructions are posted on a glass-covered bulletin board by the side of the responsibility board. They state definitely what is expected of the student in fulfilling his obligation and he is graded on his ability to carry through these instructions.

The responsibility-assignment board economizes the students' time as well as the instructor's. It eliminates waste of materials by having an assigned student responsible for the material, and the equipment is kept in a neater and more usable condition. It also provides the student with definite

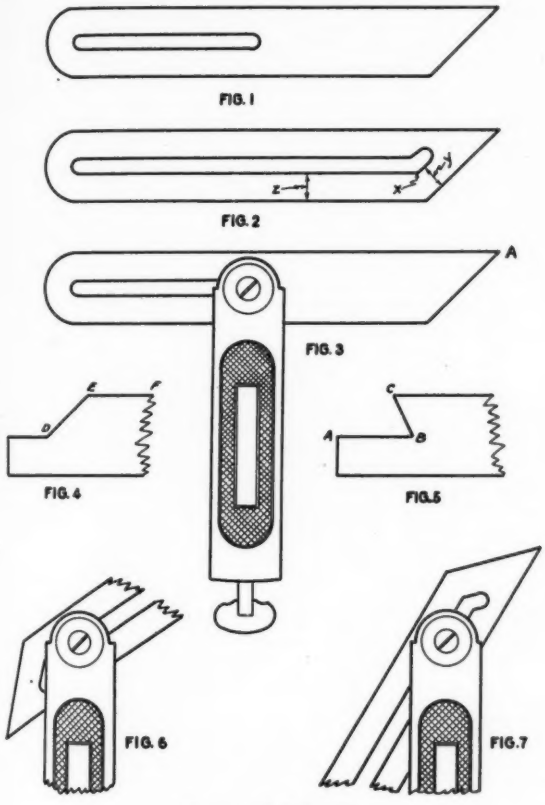


obligations and responsibilities, thus giving him real character training in the shop course.

THE T BEVEL

E. D. Meyer, Oregon State Agricultural College, Corvallis, Oregon

The T bevel is a very useful tool, but its generally accepted design can be easily improved so as to increase its range of usefulness. This same statement can, no doubt, be made concerning many other tools. It is common practice among experienced mechanics to refit and to improve the commercially accepted form of certain tools before they are put to use. It may be only a change in the bevel on edge tools; or a different pitch to the handle or teeth of a saw; the addition of a refinement here and there, but the improvement is real and, in most cases, quite worth while.



Improved T bevel

Most T bevels are purchased with the blade formed as shown in Figure 1. The distance from point A to the beam (Fig. 3) cannot be made shorter than 2¾ in. on the average 6-in. T bevel. There are times when it is necessary to set the bevel to an angle similar to angle DEF, Figure 4, or ABC, Figure 5, where the distances DE and BC are too short to obtain a good setting with the rounded end of the blade and where the pointed end cannot be drawn back far enough to be of maximum usefulness in laying out or testing these angles. Instances similar to this often occur in the work of the patternmaker, both at the bench and on faceplate work at the lathe. Similar cases come to the cabinetmaker and other woodworkers.

To improve this tool, the blade of the bevel may be further slotted as shown in Figure 2. This can be easily done by sawing with a hack saw parallel to the sides of the blade to point X. Break out the waste strip and file the edges of the slot smooth. From point X a rat-tail file is used to finish the small section of the slot leading toward the tip of the blade. File the slot uniform in width and maintain the distance at Y equal to Z. More material may be removed so that Y is reduced to about one half the width of Z if desired and the blade will still be sufficiently strong.

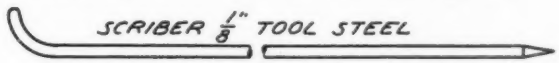
Some T-bevel blades may be too hard to saw and file. It is a simple task to anneal the blade, and when the slot has been completed to harden and temper the blade again.

After these slight changes have been made, bevels, shoulders, and depths of less than ¼ in. may be measured, no matter whether the angle be obtuse or acute (see Figs. 6 and 7). The removal of the material from the center of the blade does not weaken it enough to cause trouble. In the shop where the writer is employed many of the T bevels have been altered in this manner and have been in use for several years without signs of weakness, but with a greatly increased range of usefulness.

SCRIBER FOR THE METAL SHOP

Mark L. Gluckman, New York City, New York

The scriber described herewith is made of ⅛-in. drill rod. It is filed to a point at one end, rounded, and bent to shape as shown on the other. It is then hardened and ground.

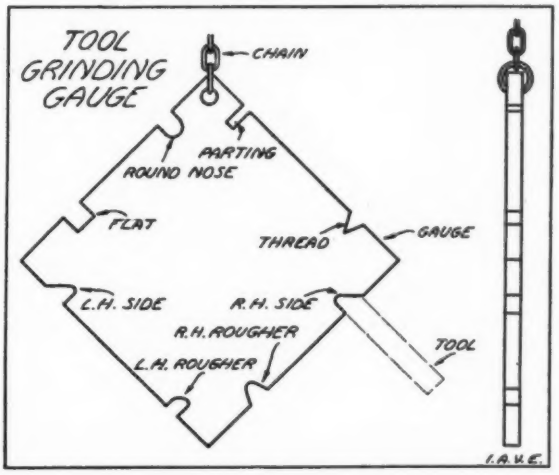


Unlike the usual scriber, this one has no point on the bent end, thus making it impossible for the beginner to hurt himself. The bend at the one end makes it impossible for the tool to be used as a center punch. The length of the scriber can be varied to suit conditions.

TOOL-GRINDING GAUGE

N. M. Moore, Hamilton, Ontario, Canada

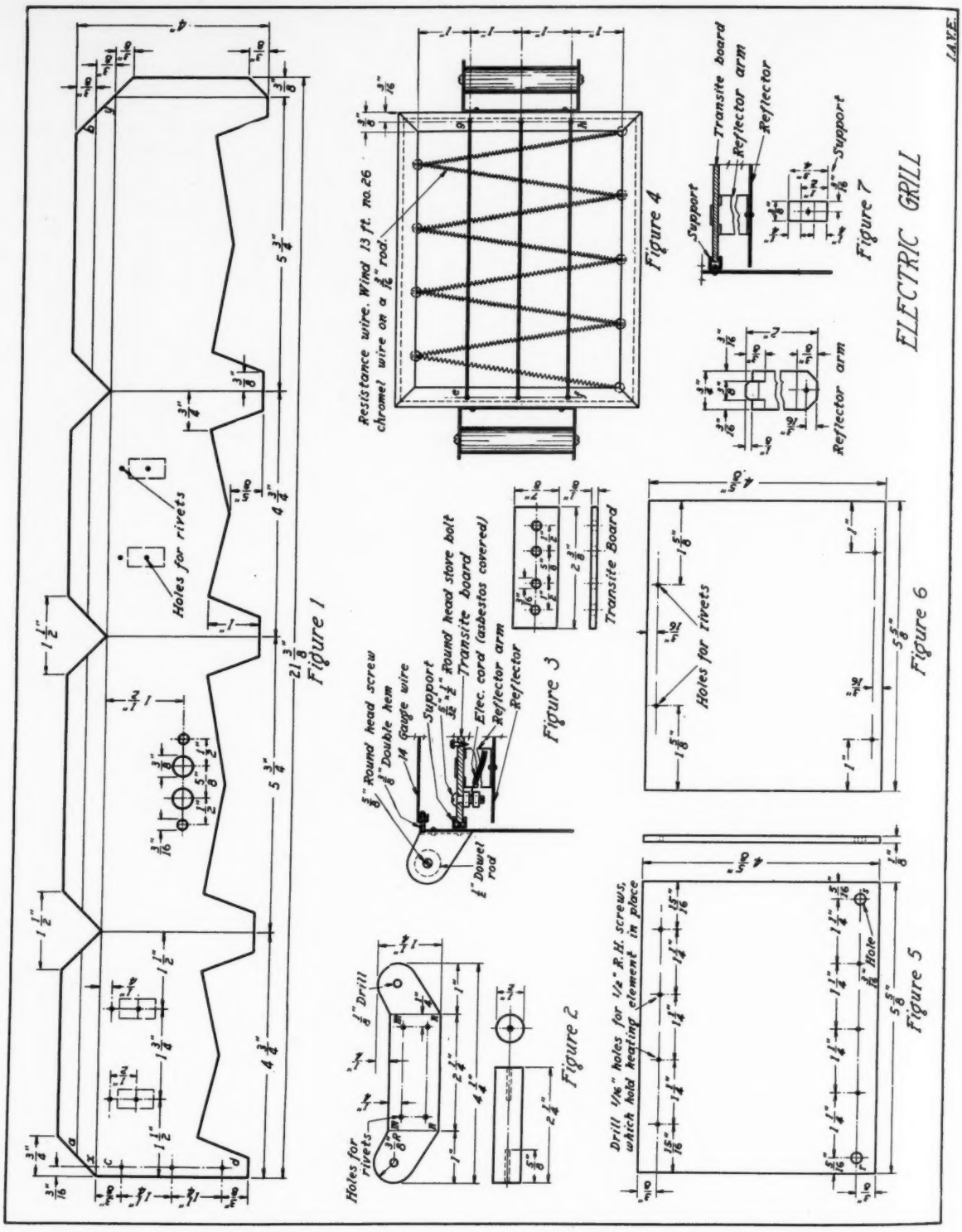
Many machine-shop students find it difficult to remember the shape of the ordinary cutting tools. The demonstrations on tool grinding evidently do not provide them with a permanent impression of the proper shapes, so that when they try to grind a tool for a certain purpose, they fail to produce a well-shaped tool. To solve this problem, the gauge illustrated herewith was made of sheet metal. It hangs beside the tool grinder, and the pupil quickly acquires a mental picture of the various shapes and then learns to grind them without further reference to the gauge.



ELECTRIC GRILL

Ira C. Madden, Detroit, Michigan

The electric grill described and illustrated herewith is a problem in electrical construction that has proved very interesting to all types of boys in the eighth grade.



Method of Teaching

Each pupil who selects to make one, is required to make free-hand sketches of the different parts. The drawings are carefully checked by the instructor, after which the pupil follows his own drawing while doing the job. He is then required to fill out the "job checking sheet." When this is filled out satisfactorily, he is allowed to start his job from a job sheet. At various stages, after layout work has been done, steps are included which makes it necessary for the worker to get an O.K. from the instructor before he is allowed to proceed. This arrangement makes it possible for each student to work out his own problems without waste of material. Some of the pupils need extra help which is given to them individually when necessary.

It is suggested that the following demonstrations be given: (1) layout of body, (2) developing pattern for legs, (3) winding element, (4) attaching element to transite board.

JOB CHECKING SHEET

Before beginning the Electric Grill, it is necessary that this sheet be filled out satisfactorily.

Complete the following statements:

1. When punching or drilling a screw hole in metal, select a ..... punch the size of the ..... part of the screw.
2. Place a .... under metal when punching holes.
3. Mitered corners are laid out at ..... degrees.
4. When making an electrical connection, wind the wire in a ..... direction.
5. Use the ..... of the tin snips when notching.
6. A rivet hole should be the ..... size as the rivet.
7. The center of a rectangle or a square may be found by drawing .....

Tools Required: Straight tin snips; mill file; ruler; steel square; wing dividers; solid punch; rivet set; riveting hammer; element winder; miter box; hand drill; screw driver; sloyd knife; hack saw; pliers; vise; 3/8-in. hollow punch.

Material Required: IXX charcoal tin; 8-oz. rivets; two 5/32 by 5/8-in. r.h. stove bolts (four nuts to fit); nine 5/8-in. r.h. screws; 1/2-in. dowel rod; 14-gauge common wire; 26-gauge resistance wire; flexible braided wire (asbestos covered); 1/8-in. transite board; 3/8-in. asbestos bushing.

Questions:

1. Why isn't copper wire used for the element?
2. What is the purpose of the transite board?
3. How many rivets are there in a box of 1-lb. rivets?
4. If the element wire was 2 ft. longer, would more or less heat be given off? Why?

References:

Keene's *Mechanics of the Household*, p. 329.

R. L. Welch's *Elements of Sheet Metal*, p. 21.

INSIDE CALIPERS

W. P. Childs, Ann Arbor, Michigan

(See Supplement No. 287)

The 4-in. inside caliper described herewith, is a project that has proved very popular in machine-shop classes. While there are many operations required in the making of this tool, the cost of material is very low. This caliper requires more skill and care than does the flat-leg caliper, described on page 337 of the September, 1928, issue of the INDUSTRIAL-ARTS MAGAZINE. For that reason it should be attempted only by students who are well along toward the end of the first years in machine-shop work.

The project is started by using a piece of 1/4 by 3 7/8-in. round tool steel. Midvale yellow-label tool steel, containing 80 per cent carbon, has been found very satisfactory. The steel is heated to a cherry red and then drawn down from 1/4-in. diameter to 1/16-in. diameter in a length of 3 in. Care should

Method of Procedure

A. To Make Body of Grill (Fig. 1)

1. Cut out a piece of bright tin 4 by 21 3/8 in.
2. Lay out sides and ends and square lines across.
3. Lay out line *ab* 3/8 in. from top.
4. Lay out line *xy* 3/4 in. from top.
5. Lay out mitered corners.
6. Have your work checked.
7. Cut out mitered corners.
8. Locate and punch rivet holes on line *cd* 3/16 in. from corner.
9. Develop pattern for the legs. (It is suggested that you cut out paper the size of the end and side, fold it and develop a half pattern.)
10. Have your work checked.
11. Cut out legs.
12. True and smooth edges with a file and emery cloth.
13. Make a straight-angle bend at *ab*.
14. Make a right-angle bend at *xy*.

B. To Make Supports

15. Cut out four pieces of metal 3/8 by 3/4 in., and punch rivet holes in the center.
16. Have your work checked.

C. To Make Handles (Fig. 2)

17. Cut out the metal for two handles.
18. Make layout of handle.
19. Have your work checked.
20. Cut out handles using straight tin snips.
21. Punch rivet holes and screw holes.
22. True edges and remove burrs.
23. Bend ears at a right angle on lines *mn*.
24. Rivet top of handle to ends allowing edge to be flush with top of grill.
25. Rivet the supports, Figure 7, to the inside using the same rivet that holds the bottom of the handle.
26. Cut off two 2 1/4-in. lengths of 1/2-in. dowel rod.
27. Round ends slightly with sandpaper.
28. Locate and drill screw holes in center of ends.
29. Fasten dowel rod to ears with 5/8-in. r.h. screws.
30. Have your work checked.
31. Form grill into rectangular shape.
32. Place lap under metal and mark rivet holes on lap.
33. Have your work checked.
34. Punch rivet holes.
35. Rivet lap to end.

D. Wiring Top (Fig. 4)

36. Lay out center lines *ef* and *gh*.
37. Lay out wire holes.
38. Punch holes for wire using a piece of scrap wood clamped in a vise as a block. Allow the stock to project 3 in. above the vise.
39. Cut off three pieces of 14-gauge wire 5 7/8 in. long.
40. Make a 1/4-in. right-angle bend on the end of each piece.
41. Place formed end in hole and get measurement for other bend.
42. Have your work checked.
43. Finish bends with pliers and hammer.

E. Making the Element (Fig. 5)

44. Lay out a piece of transite board 4 5/8 by 5 5/8 in.
45. Locate holes.
46. Have your work checked.
47. Use a hack saw and cut transite to dimensions.
48. Drill 3/16-in. holes at *r* and *s* for the 5/32 by 1/2-in. r.h. stove bolts.
49. One-sixteenth inch holes are drilled at the other locations.
50. Put 1/2-in. r.h. screws in the 1/16-in. holes and allow the heads to project 1/8 in. above the transite board.
51. Place two chalk marks 13 ft. apart on the floor of the shop.
52. Cut off a 13-ft. length of 26-gauge resistance wire. (Two pupils should work together when winding element to avoid kinks in the wire.)
53. Wind wire into a long coil.
54. Straighten ends of wire for a distance of 1 1/4 in.
55. Grasp ends of coil and stretch it 8 in.
56. Get your work checked.
57. Divide the coil into 8 equal parts and separate slightly at these divisions.
58. Put the ends of wires through the 3/16-in. holes in the transite board and put in the stove bolts and put on a nut. Wind the element wire and the extension cord around the stove bolt and fasten with a nut. (See Fig. 3.)
59. Stretch coils around screws.
60. Bend top of 3/8 by 3/4-in. supports at right angles with a screw driver.
61. Put in the transite board with the element and bend the lower part of the supports to hold everything in place.

F. Reflector (Fig. 6)

62. Cut out a piece of bright tin 4 5/8 by 5 5/8 in.
63. Punch rivet holes as indicated in drawing.
64. Round corners slightly with a file.

G. To Make Reflector Arm (Fig. 7)

65. Cut out four pieces of bright tin 3/4 by 2 in.
66. Study Figure 7 and make layout.
67. Get your work checked.
68. Rivet arms to reflector.
69. Make right-angle bends at lower 3/8-in. measurement.
70. Bend the 3/16-in. supports at right angles with a pair of pliers.
71. Slip reflector arms between metal and transite board, and bend 3/8-in. part down at right angles.
72. Attach plug.
73. Paint wooden part of handles red.
74. Get your work checked and graded.

be exercised while doing this, so as not to crack or overheat the metal. The stock should be drawn down square in shape, then hexagon, and finally carefully rounded. Be careful not to cool the material too quickly, as it will harden and become difficult to work.

After the piece has been forged to within 1/64 in. of the correct size, the large end should be chucked in a lathe and the entire length of the leg carefully filed to a round, smooth finish on the forged portion. A 10-in. mill file has been found satisfactory for this job. Next, carefully finish the end of the leg while yet in the lathe. Then polish with 2/0 emery cloth and oil to a good finish.

After the lathe work has been completed, finish the upper part by filing to the required shape and dimensions in a bench vise. After the upper end and spring seat have been completed, either file or drill the spool seat. If several calipers are to be made, it will pay to make a simple jig, for holding the legs in pairs in order to drill the spool seat in both at once. This method is more satisfactory, more accurate and teaches the boy the use of fixtures in machine work.

The next operation is to carefully drill the legs for the adjusting screw. One of the legs is drilled through and the other only partially through. For the drilling use a 1/16-in. drill for both legs. These holes may be finished to the required shape by using a fine Swiss file, or a little fixture for holding the leg to the compound rest of a lathe may be made, and a spline milling cutter used in the lathe chuck. The latter method gives the best results and is very much quicker, after once the fixture is rigged up. The last machine operation is to drill the pinhole for the pin which holds the adjusting screw.

When the machine work has been completed, the legs are ready to be hardened and tempered. This is done by carefully heating them all over to a cherry red and then quenching them in standard hardening oil. The material should then be drawn to a blue and allowed to cool in the air. After cooling, the legs should be polished to a bright finish.

The adjusting screw may be threaded with a hand die or with a self-opening die in a screw machine. If it is threaded with a hand die, the piece may be held in a vise and the die turned, or the piece can be held in the lathe or drill-press chuck and the material turned. When the piece has been threaded, the cross hole for the pin should be drilled and then the unthreaded end of the screw rounded.

The adjusting-screw ball may be made in the lathe, or better yet, on a hand-screw machine. The tap-drill hole should be drilled first and then the ball formed with a formed tool. After that has been done, the ball should be tapped by hand.

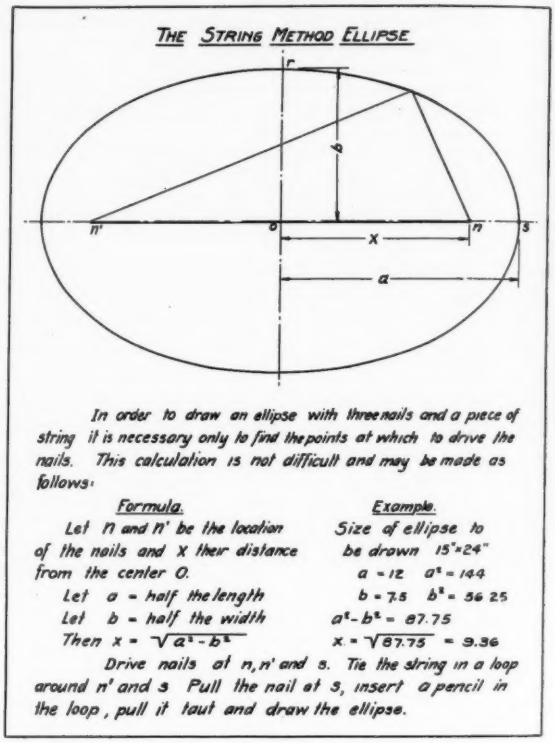
The caliper spool is made of ¼-in. round 1020 S.A.E. cold-drawn steel. This piece may also be made on the hand-screw machine, or turned up on the lathe.

The adjusting-screw nut is made of 7/16-in. round 1020 S.A.E. cold-drawn steel. It may also be made with a formed tool on the hand-screw machine, or with an ordinary tool bit in the lathe. The knurling should be done with a medium knurl.

The adjusting-screw washer can be made by either of the methods just described.

The last piece to be made is probably the most difficult of all and the one on which the proper working of the tool hinges. The spring should first be carefully laid out on annealed spring steel .050 in. thick by ⅝ in. wide. The small notches in the end of the spring are very important, and unless accurately laid out and cut, the spring will not set properly into the spring seats in the legs. Following the layout, the spring should be ground to close approximation of the form desired, and then finished by hand filing. The next step is to carefully form the spring, while heated to a cherry red, around a ⅝-in. round rod. Be sure that the notches are opposite each other. Reheat the spring to a cherry red and quench in a light hardening oil. Draw to a light blue and allow to cool in the air. If the hardening and drawing are not properly done, the spring will break when it is placed on the caliper legs.

After having made all the parts, the next step is to assemble them. Start the assembly by pinning the adjusting screw into the proper leg. Put the other leg over the adjusting screw, put the washer and nut on the adjusting screw and follow them with the ball, tightly screwed into place. Put the spool between the two legs and force the spring onto the top of the legs. The caliper is now assembled and is ready for the final touching up and adjusting. If the work has been properly carried through, a very fine tool will have been produced.



In order to draw an ellipse with three nails and a piece of string it is necessary only to find the points at which to drive the nails. This calculation is not difficult and may be made as follows:

Formula.	*Example.*
Let n and n' be the location of the nails and x their distance from the center O.	*Size of ellipse to be drawn 15"×24"*
Let a = half the length	$a = 12$ $a^2 = 144$
Let b = half the width	$b = 7.5$ $b^2 = 56.25$
Then $x = \sqrt{a^2 - b^2}$	$a^2 - b^2 = 87.75$
	$x = \sqrt{87.75} = 9.36$

Drive nails at n, n' and s. Tie the string in a loop around n' and s. Pull the nail at s, insert a pencil in the loop, pull it taut and draw the ellipse.

Instruction sheet submitted by W. A. DeVette, Technical High School, Erie, Pennsylvania

KEY CABINET

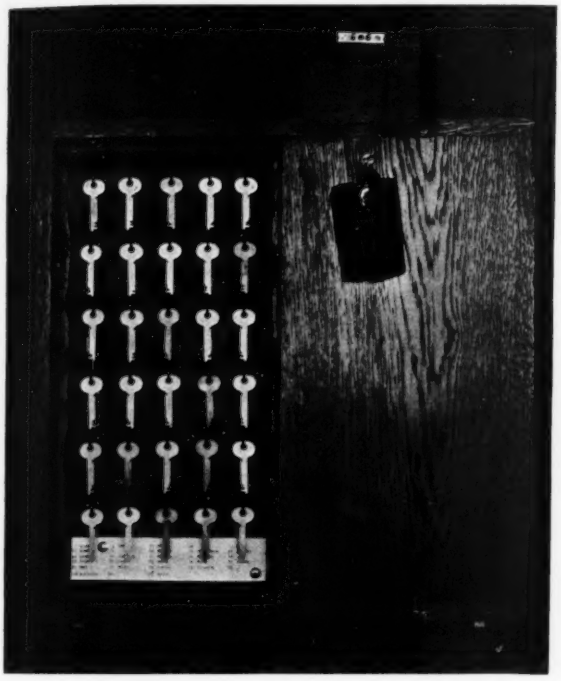
Herman Hjorth, Saunders Trades School, Yonkers, New York

A drawer or locker for every student where he can keep his unfinished work, blue prints, notebooks, etc., and to which he alone has access, is not only a great convenience, but an absolute necessity in the modern school shop. The only way, however, to make sure that such keys are not forgotten, mislaid or lost is to keep them in the shop in a special key cabinet, to which only the teacher has the key.

The accompanying illustrations show a key cabinet designed for four classes with thirty students each. The design may be modified to accommodate any number of classes and keys by altering the dimensions. The cabinet consists of four boards joined together to form a square frame. Four keyboards (one for each class) are made to slide between guide strips from one side of the frame to the other. These keyboards are made of ¼-in. plywood. Two ¾ by ¾-in. strips are glued to each side to prevent the plywood from warping out of shape. These strips also make it impossible to remove any key when the cabinet is locked.

The locking mechanism consists of a hinged, cleated lid which is fitted into an opening cut in the upper board of the frame. This lid is locked with a chest lock to a ¾-in. board, which is screwed to the frame and covers the keyboards when they are in the locked position.

At the beginning of class the teacher opens the cabinet and slides out the keyboard for that class. If everyone is present, the keyboard may be left out and the other three locked. If some members of the class are absent, the keyboard should be pushed back and locked with the others, after those present have obtained their keys. At the end of the class period, the teacher again opens the cabinet, pulls the keyboard out, and calls for the keys of those who were present. A typewritten card with the names of the students and their key numbers should be fastened to the board to facilitate the checking of the keys.

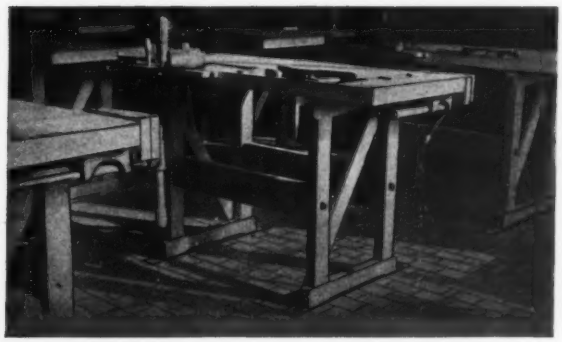


Key cabinet with one keyboard exposed

ANCHORING AND BRACING WOODWORKING BENCHES

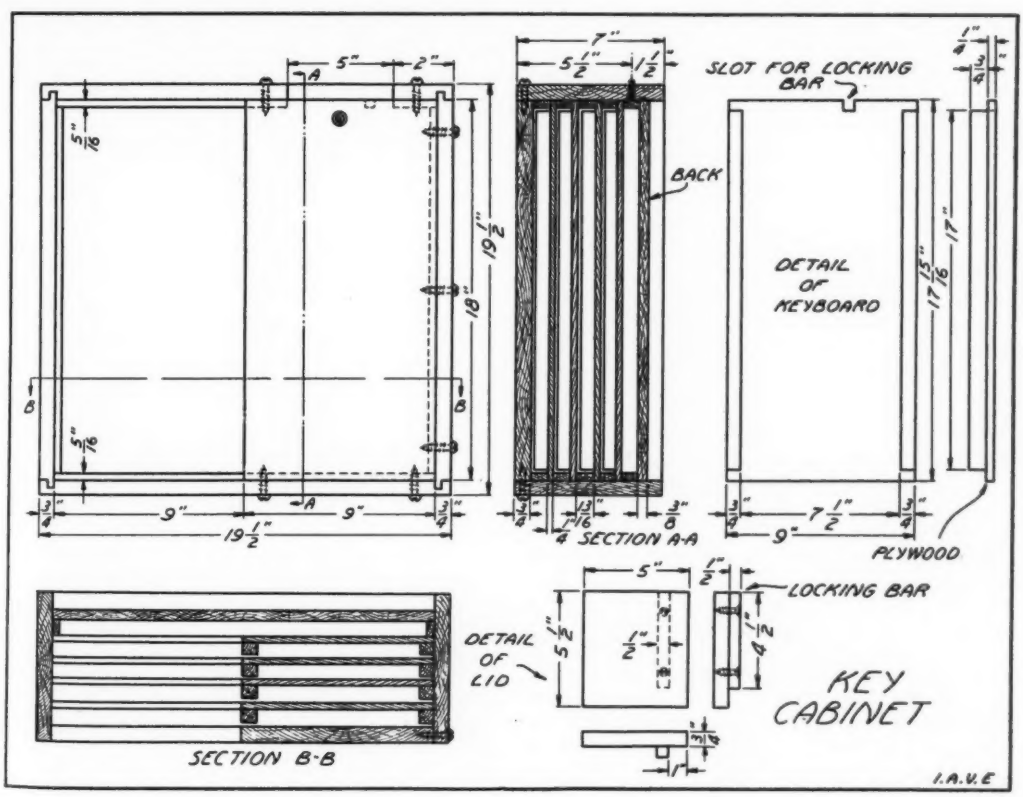
John W. Kurtz, South High School, Omaha, Nebraska

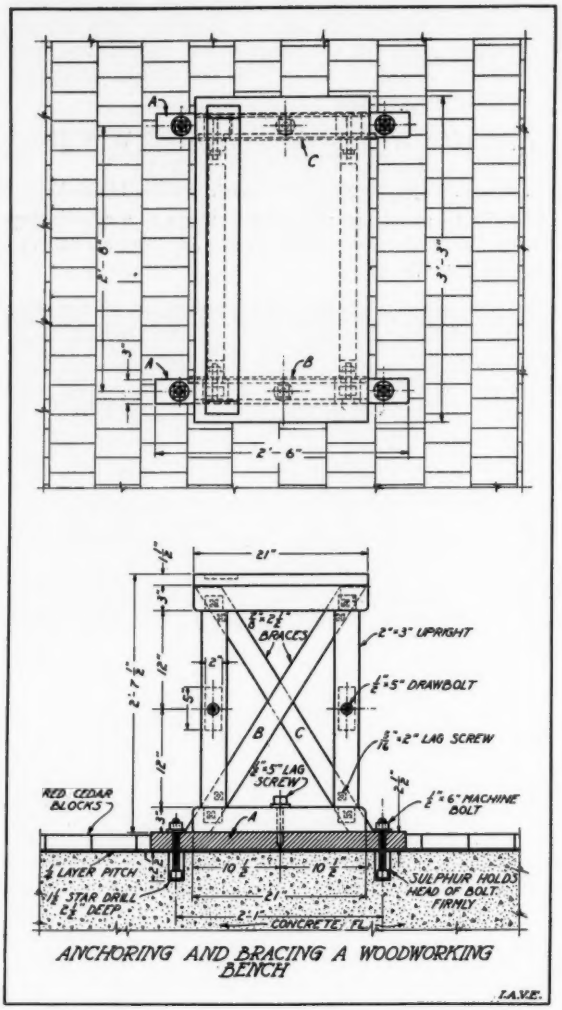
In order to anchor woodworking benches in a school shop on an end-grained wood-block floor, the following method was successfully used:



Method of bracing and anchoring workbenches

Sufficient wood blocks were removed to provide space for the sleepers AA. A jig was then made to spot the holes for the machine bolts in the concrete. These holes may be made either with a star drill and hammer or with an air drill. The powdered concrete may be removed from the holes with the bellows, or water may be poured into the hole and the paste removed with a small wood paddle.





ANCHORING AND BRACING A WOODWORKING BENCH

I.A.V.E.

Another jig was then made for holding the inverted bolts in an upright position, while melted sulphur was poured around the head of the bolt in the concrete. Use a deep-covered container for melting the sulphur as the gas ignites very easily. An old coffee pot answers very well.

After the sulphur has hardened, hot pitch is poured in to fill the balance of the recess and then the sleepers are pulled down to the floor by means of the nuts on the bolts.

Lag screws are used to hold the bench down to the sleeper.

Braces B and C may be added on the inside of the bench legs to thoroughly brace it.

MORTISE-AND-TENON JOINT — II

John E. Doren, Eureka High School, Eureka, California

Reasonable Proportions for Tenons

When designing or detailing mortise-and-tenon joints, there are several factors that should be considered: factors that influence *thickness*, factors that influence *width*, and factors that influence *length* of tenons.

A. Factors that Influence the Thickness of Tenons

1. The standard mortising chisels, in cases where the mortises are cut by machine, varying in size from ¼ to ⅝ in. by sixteenths, and from ⅝ to 1¼ in. by eighths.

2. It is common practice to make the thickness of the tenon approximately one third the thickness of the material.

3. When stock is grooved for panels, it is wise to make the thickness of the tenon the same dimension as the width of the groove.

4. Peculiar or special details of the work, such as the position of grooves or rabbets and their relation to the thickness of the pieces to be joined, may also influence the thickness of tenons.

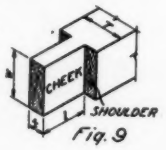


Fig. 9

THICKNESS OF MATERIAL	THICKNESS OF TENON
7/16 TO 9/16	1/4 TO 7/16
11/16	5/16
7/8 TO 1	5/16 TO 1/2
1 1/8 TO 1 1/4	7/16
1 3/8 TO 1 1/2	1/2 7/16 1/2
1 5/8 TO 1 3/4	1/2 7/8 1/2

Let T in Figure 9 represent the thickness of the material, and t the thickness of the tenon, then the approximate thickness of the tenon may be expressed by the formula

$$t = \frac{T}{3} \pm$$

Varying conditions may warrant a difference in the thickness of tenons, but in general, the thicknesses listed in the table shown above will be found very satisfactory. This table represents the common practice followed by woodworkers.

(To be continued)

Some Questions Answered

BAND-SAW BRAZING

975. Q.: I have a small 10-in. band saw, 66-in. blade. We have considerable trouble with breaking blades. What size (width) blade would you suggest using? How may these blades be brazed? Can it be done in a small shop, and without any special equipment? — *K.W.N.*

A.: Breakage in small band saws may be caused by using a saw blade that is too thick rather than too wide. I should advise the use of the special saws made for the small band saws. These are made of a special flexible steel. A blade ¼ in. to ⅜ in. wide should be wide enough, but a small wheel will always break the blades sooner than a large wheel.

The brazing of a saw blade requires special equipment, and it would not pay a person having only one band saw to supply himself with this equipment. It would be more economical to have some saw expert do the brazing from the standpoint of safety, too. A saw blade that is not properly brazed may be weakened, the blade may not be scarfed right and be too thick, the braze may be too hard, and any of these conditions would cause the blade to be broken again in a short time. A broken band saw is always a source of danger. — *Lyle M. Garnett.*

REMOVING WARP

975-a. Q.: What is the best way to remove the warp and wind in a wide board? I have a top for a piano bench of oak which is slightly warped. Would steaming bring it out? This top is one piece about 16 by 36 in. — *K.W.N.*

A.: There really is no way of removing the warp in a piece of oak such as described except to rip the piece into narrow strips and reglue the board, adding a new strip of material to compensate for the material removed in the saw cuts and the planing of the boards in making the new joints. In making a top such as this, the annual rings should be alternated to eliminate as much warp as possible. Some persons have tried steaming, some have tried sponging the concave side and some have tried heating the convex side, but these methods have never proved successful. — *Lyle M. Garnett.*

CONVERTING A 25-CYCLE MOTOR

976. Q.: I have on hand two ¼-h.p. 25-cycle motors which I would like to convert into 60 cycle as projects in my elec-

tric shop. I had planned on following the data as contained on a ¼-h.p. 60-cycle motor, which Mr. Clarence Crofoot recommended as an educational project in one issue of your magazine. I find that it will be impossible to do so, since there are only 24 slots in the 25-cycle motor armature as compared with 36 in the educational project. Would it be possible for you to give me the information which I need? —*P.J.H.*

A.: A 25-cycle induction motor is generally wound for two poles and 1500 r.p.m. A motor thus wound (if reconnected) would have a speed of approximately 3600 r.p.m. on a 60-cycle line of the same voltage.

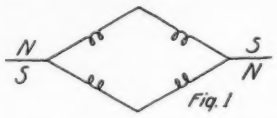


Fig. 1

Some motors will not start properly with this change and the speed is excessive for most purposes. Due to these facts, it is generally found necessary to rewind for four poles and a speed of approximately 1800 r.p.m. on 60-cycle.

To do this rewinding, it is advisable to count the number of turns used on the original winding and distribute the same on four instead of two poles. The pole windings are then connected in series parallel as shown in Figure 1. This should be done with both the starting and running windings.

By this method it is unnecessary to change the size of wire and the number of turns as would be done commercially. — *B. B. Burling.*

Personal News

MR. CRESSMAN GOES TO LANSING

Mr. P. L. Cressman, supervisor of industrial and continuation education of Pennsylvania, has recently been elected assistant state superintendent of public instruction for Michigan. He is succeeding L. H. Dennis, who has gone to Washington, D. C., to take charge of the headquarters to be established there for the American Vocational Association.

MR. P. L. CRESSMAN
Assistant State Superintendent of Public Instruction, Lansing, Michigan

Mr. Cressman is a native of Pennsylvania. He is a graduate of Keystone Normal School, Kutztown, Pa., and the University of Pittsburgh. His graduate work was taken at Teachers College, Columbia University, and at the Pennsylvania State College.

He is well fitted for his new work by both practical and teaching experience, and his love for the schoolboy has been more than demonstrated by his intense interest in the spreading of the Junior Mechanics Clubs throughout the United States. He also is known for his activity in educational associations and for his contributions to the professional magazines of his field.

¶ L. M. ROEHL has been given the title of professor of farm mechanics by the State College of Agriculture, Cornell University, Ithaca, N. Y.

Associations, Conventions

EASTERN ARTS ASSOCIATION CONVENTION

The Eastern Arts Association convention will be held April 4 to 7 at the Seneca Hotel, Rochester, N. Y. Mr. Joseph H. Constantine, president of the association, will preside.

The speakers at the general session for Thursday morning are Dr. James M. Spinning, superintendent of schools, and Herbert C. White. For Thursday evening Clarence A. Barbour, Brown University, Providence, R. I., has been secured. Friday at 2 p.m., Prof. Irving V. Sollins, Anglo-American Institute, First Moscow University, and Royal Bailey Farnum, Providence, will be the speakers.

There will be departmental sessions Thursday afternoon and Friday in art and industrial education. For the latter, at the meeting on Thursday at 2 p.m., W. Howard Pillsbury, Schenectady, N. Y., will speak on the "Importance of Industrial Arts Under Changing Social Conditions," and Herbert G. Lehmann, Trenton, N. J., will discuss "Electrical Projects for Junior High Schools."

Friday morning Benjamin H. Stasch, Corning Free Academy, Corning, N. Y., will give an address on "Adventures in the Industrial-Arts Shop," and William Small, Niagara, N. Y., will speak on "The Industrial School as an Industrial Service Agency." Mr. G. A. McGarvey, United States Department of the Interior, will discuss "Recent Development in the Field of Industrial Education." Mr. Hugh Flaherty, Floral Park, N. Y., will speak on "The Industrial-Arts Phase of Printing Instruction" at the Friday 10 a.m. session, and Harry L. Gage, American Institute of Graphic Arts, will speak on "The Place of Printing in the Graphic Arts." H. S. Bennett, Rochester, N. Y., at the same session, will discuss "Coördinating the Graphic Arts in the High School."

At the Friday 4 p.m. session Dr. J. A. Randall, Mechanics Institute, will speak on the "Philosophy, Methods, and Procedure in the New Program," and W. N. Fenninger, New York State Education Department, Albany, N. Y., will discuss the "Criteria for Judging the Teaching of Shopwork." — *Burton A. Adams.*

MICHIGAN INDUSTRIAL-EDUCATION ASSOCIATION CONVENTION

The seventh annual meeting of the Michigan Industrial-Education Society will be held April 20 and 21, at Battle Creek.

Under a new plan, the former three-day meeting has been concentrated in a two-day session, with round-table discussions on Saturday. A number of prominent speakers have been obtained to address the society.

Visitors to the meeting will be especially interested in the Ann J. Kellogg School, the Vocational School, the Southwestern Junior High School, the Southeastern Junior High School, and the Kellogg Junior High School.

Information concerning the meeting may be obtained from Mr. Melvin Hall, secretary, Lansing, Mich.

ILLINOIS VOCATIONAL ASSOCIATION MEETS

The Illinois Vocational Association will hold its annual meeting on March 30 and 31 at the University of Illinois, Urbana.

At the general session at which N. F. Fultz, president of the Association, will preside, Mr. J. C. Wright, assistant U. S. Commissioner of Education, will discuss "Economic and Social Trends in Vocational Education."

The annual banquet will be held Friday evening at 6:30 p.m. Prof. Arthur B. Mays, of the University of Illinois, will be the toastmaster, and Dean Mumford, of the College of Agriculture, Mr. L. H. Dennis, executive secretary of the American Vocational Association, and Dr. Noland, of the Department of Agriculture, will present their addresses.

Round-table discussions in woodworking, auto mechanics, general shop, general drafting, metal work, printing, agriculture, industrial education, home economics, art economics, part-time education, and vocational guidance will also be held.

At the round-table luncheon to be held Friday at 12 m., Mr. L. P. Elliott, supervisor of industrial arts in Peoria, will preside. The use of Illinois Vocational Association literature and of proposed studies of standards will be discussed.

An industrial-arts and vocational competitive exhibit, comprising a display of drawing and shopwork, will be held at the University of Illinois in connection with this convention. The competition is open to any school below the junior college level in the State of Illinois. Drawings will be scored for weights of lines, lettering, neatness, accuracy, and agreement with modern practice.

In the auto-mechanics section there will be competitive tests in locating and remedying of troubles. Electrical exhibits will be given functional tests. They will also be graded on accuracy of their rating and on workmanship. Machine-shop and tool entries will be scored on selection of stock, design, accuracy, finish, and preparation of material. They will also be given utility tests if possible. Patternmakers must accompany their patterns by castings in iron, aluminum, or lead, to prove their practicability. Woodworking problems will be scored on design, selection of stock, joints, workmanship, and finish. There will also be exhibits of the work from printing classes, general-metal shop, and on operative shop projects.

ILLINOIS DRAFTING RESEARCH GROUP

During the present critical period it has been deemed particularly important that each shop teacher strengthen himself professionaly and help organize his subject to protect it from the fad-and-frill attack.

Recently, there has been developed a progressive and aggressive body of drafting teachers of the state under the name of the Illinois Drafting Research Group. The purpose of the organization is to carry on a continuous and coöperative study of drafting problems, to (1) determine the kinds of mechanical drawing to be taught, (2) analyze the kinds of drafting to determine the number of learning units, (3) adopt uniform standards of practice and nomenclature, (4) determine the related information and shopwork to be taught, (5) develop standards of achievement to be measured by standard tests, and (6) to promote the correlation of drafting and related subjects, academic and shopwork.

The work is being carried on by correspondence, under the direction of Mr. H. D. Campbell, Morton High School, Cicero, Illinois, chairman of the group. The results of the group's findings will be presented in the form of a tentative report to the active members following its approval by the majority.

SCHOOLMEN'S WEEK AT UNIVERSITY OF MINNESOTA

A series of meetings devoted to industrial education have been arranged for the annual Schoolmen's Week, to be held Tuesday, March 27, at the University of Minnesota, Minneapolis. Mr. Thomas F. Richards, of Winona, will preside at the sessions.

The topic for discussion at the meeting will be "What the New Day Demands." Mr. Clyde A. Bowman, of The Stout Institute, Menomonie, will discuss "Industrial Arts," and Prof. Homer J. Smith, of the University of Minnesota, will take up the subject of "Vocational Preparation." The discussion will be led by Mr. H. T. Widdowson, state supervisor of trade and industrial education, St. Paul.

FEBRUARY MEETING OF THE MASSACHUSETTS INDUSTRIAL EDUCATION SOCIETY

The Massachusetts Industrial Education Society held its regular monthly meeting on Saturday, February 10. The guest speaker was Mr. Ralph M. Fullerton, general superintendent of the B. F. Sturtevant Co. His subject was "Vocational Education from the Employers' Viewpoint."

Mr. Fullerton stated that during the depression many industrial concerns have discontinued their apprenticeship-training programs, and that he expected very shortly that there would be a shortage of skilled help. Many of the older workers have died during the depression while others have gone into other occupations which they will not leave. Due to this condition, he said that he expected vocational education to advance more in the next five years than it has in any such period of the past.

In discussing the taxpayers' objections to this type of educational work, he said that the trained boy will repay the city, state, and nation with values that cannot be measured in dollars and cents. — *Louis A. Van Ham.*

FIRST OHIO CONFERENCE ON INDUSTRIAL ARTS

The first Ohio Conference on Industrial Arts was held January 20 at the Ohio State University, Columbus, with Prof. Fred C. Whitcomb presiding.

Representatives of the various districts discussed plans for the October meeting. Mr. Christy stressed the necessity of obtaining strong speakers to present various phases of the subject to teachers.

It also was agreed that a number of monographs should be prepared, these to be in the nature of a prospectus of industrial arts in the state. They should be prepared especially for teachers, supervisors, administrators, and interested laymen. The monograph, it was urged, should be a forerunner to a series of more specific studies and monographs on the part of representative individuals and groups in the state.

Mr. Elmer W. Christy led in a discussion of the matter of coördinating and developing industrial-arts interests in the state, and Dr. William E. Warner discussed the plans of operation suggested by the advisory committee. Dr. Warner was appointed to serve as clearing agent in connection with the new program of coördination.

It was decided to hold the next meeting on April 6, in the Faculty Club of the University. — *Clarence F. Bateman.*

PEORIA INDUSTRIAL-EDUCATION CLUB MEETS AT GALESBURG

The February meeting of the Peoria Industrial-Education Club was held February 7, at Galesburg, in connection with the Western Illinois Industrial-Arts Round Table. About 75 superintendents, principals, supervisors, and teachers were in attendance. Mr. Thomas U. Brooking acted as chairman, and introduced Mr. H. A. Crawford, who took charge of the meeting.

Supt. O. Young, of Galesburg, the first speaker, talked on the subject, "The Value of Industrial Arts to Galesburg," tracing the history of the movement and showing how the work had influenced high-school teaching.

Mr. N. F. Fultz, of Cicero, described the plans for the first meeting of the Illinois Vocational Association, to be held at Urbana, March 30 and 31.

Dr. W. T. Bawden, of Peoria, talked on "Impressions of the Detroit A.V.A. Meeting."

H. C. Price, of Galesburg, in his talk on "Objectives of Industrial Arts," explained how industrial arts conforms to the "seven cardinal principles of education." — *F. L. Barloga.*

CENTRAL CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION MEETS AT HARTFORD

The Central Connecticut Industrial-Arts Association held its annual conference on January 31, in the Hartford High School, Hartford, Conn.

Following the dinner, Howard C. Wiley, toastmaster, introduced Supt. Jonas M. Tompkins of the Northeastern District, who talked on "The Value of Industrial Arts." He said shopwork allows for a free spirit, gives opportunity to do things that make the boy happy in doing, and it meets the need for knowing.

Supt. James W. Freeman, of the West Middle District, speaking before the group, said the only hope of the lower 50 per cent of the children in the secondary schools is in industrial arts. He also pointed out that shopwork has many possibilities in the elementary schools.

Mr. Harrington, executive secretary of the state teachers' association, speaking on "Prices in Education," talked on evil-doers in education and said that we must curb and educate them. The tendency now is to cut the school year, said Mr. Harrington, rather than to cut any special activity when funds are lacking.

President Walter F. McAndrews presided over the business meeting. Following the approval of the secretary's and treasurer's reports, the association elected the following officers: President, John A. Houdlette, Meriden; vice-president, William F. Moran, Waterbury; second vice-president, Hosmer Jones, West Hartford; treasurer, Fred Drabble, Jr., New Britain; secretary, Harry A. Barnicle, Hartford.

The next meeting will be held on March 21.

MANUAL-ARTS TEACHERS OF PORTO RICO MEET

The first annual meeting of the Manual-Arts Teachers' Association of Porto Rico was held on December 26, at the Ateneo of Porto Rico.

President Victor Rosario, in his message, discussed the idea of publishing a manual-arts magazine.

The Association elected a board of directors, composed of the following members: Victor Rosario, president; Aguilino Rivera, vice-president; Raul Torres, secretary; Ferdinand Rossy, treasurer; Antonio Figueroa, auditor; Diego Hernandez, Andres Salazar, Oscar Bunker, and Cizar Cabrero, directors. — *José Vizcarrondo.*

SOUTHERN NEW YORK INDUSTRIAL-ARTS TEACHERS MEET

The November meeting of the Southern New York Industrial-Arts Teachers was held at Ithaca, with fifty teachers in attendance. After a visit to the shops of the Ithaca schools, the group met with Mr. Roy G. Fales who spoke on the work done by various groups and stressed the importance of monthly group meetings. It was suggested that the organization take out membership in the American Vocational Association and the state association.

At the afternoon session, means of functioning along the lines of other state groups were discussed. Mr. French made a motion that the Southern District group hold a group meeting in Owego during the latter part of January, on a date to be selected by the president. It was voted to hold group meetings once each month and to report the activities of the various groups to the president. Mr. MacIntosh, Mr. Schaff, and Mr. Meyn were appointed to assist the president in arranging for the group meetings. It was decided to hold three smaller group meetings, one at Ithaca, one at Elmira, and one at Binghamton.

Mr. Fales led a discussion concerning the various phases of the work in the preparation of courses of study.

The January meeting was held at Owego, with Mr. Albert Hubbard in charge. Forty teachers and ten young men from the automotive mechanics classes of Binghamton were in attendance.

Mr. Albert Meyn, of Ithaca, explained a scheme for checking operations in the machine shop and gave his observations on teachers, pupils, supervisors, and the field in general. Mr. Dixon gave valuable information concerning the teaching of printing in the schools and showed samples of printing done in the school printshop. Mr. Lantz, of Elmira, presented a responsibility chart for use in connection with routing duties in the woodworking shop. He displayed sample courses of study which had been worked out in his shop.

Mr. Whitmore exhibited pewter work made in the Oswego Normal School. Mr. Stasch, of Corning, displayed a diving helmet, made in his shop. The ten young men from the automotive-mechanics shops at Binghamton, gave a program of talks and demonstrations which had been given at a school assembly. Each boy carried out some phase of the work. — *R. E. Norris.*

TENTH ANNUAL JUNIOR-HIGH-SCHOOL CONFERENCE

The tenth annual junior-high-school conference will be held April 13 and 14, in the School of Education, of New York University. There will be a general session in the morning, followed by a number of group meetings in the afternoon.

The general topic of discussion will be "The Teacher a Person in the New Era."

Complete information concerning the meeting will be available from Miss Lilian O'Neill, secretary of the association.

News Notes

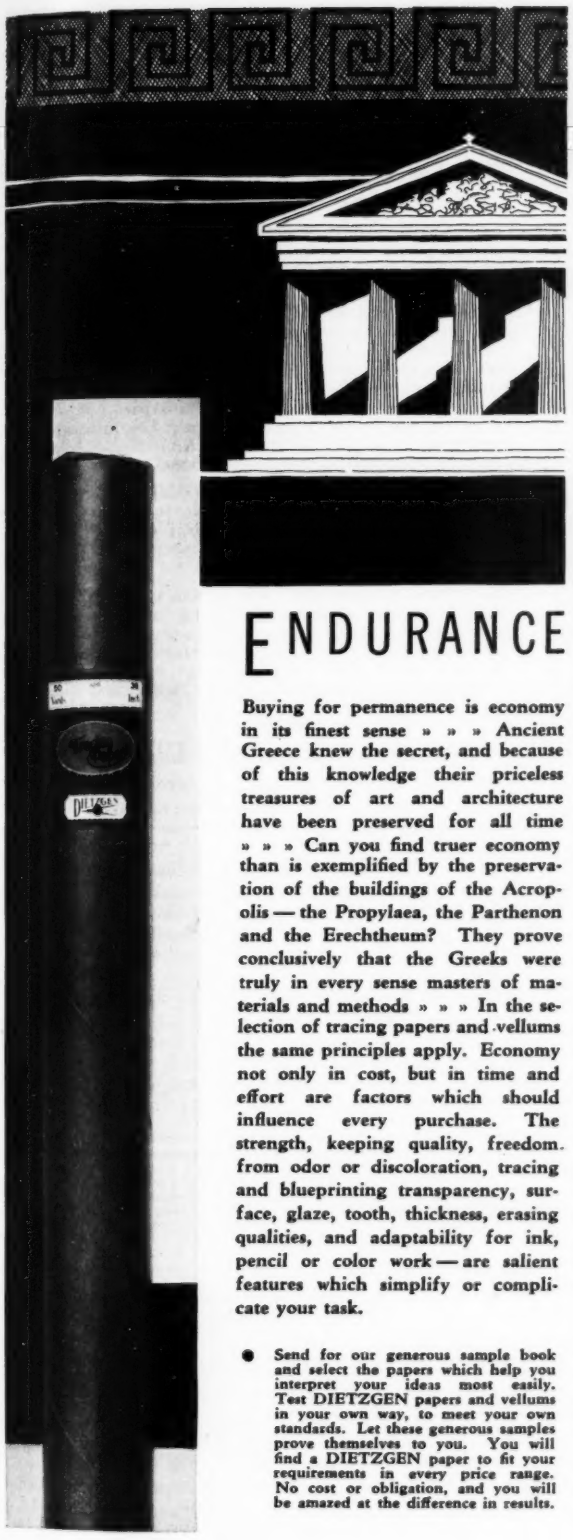
Vocational Guidance

School and college administrators who are interested in helping students to choose their careers more wisely, and who wish information to assist them in planning programs of vocational guidance, may get such information without charge from the National Occupational Conference, 522 Fifth Avenue, New York City.

Hold Tenth Annual Soap Competition

The Procter & Gamble Company, 80 East Eleventh St., New York City, have announced the tenth annual prize competition for small sculptures in white soap. The contest closes May 1, 1934. Write the Procter & Gamble Company for information.

(Continued on page 8A)



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Department of Industrial Education
Oregon State College Corvallis, Oregon

Authorized by State Board of Higher Education

(Continued from page 166)

Fisher Body Coach Building Contest

The Fisher Body Craftsman's Guild, an organization dedicated to the development of handiwork and craftsmanship among boys, has announced its fourth annual coach building competition. A total of 24 university scholarships are offered, having an aggregate value of $51,000. The scholarships are divided as follows: six of $5,000 each; six of $2,000 each; six of $1,000 each; and six of $500 each.

The project for this year's competition is again the building of a small-scale model of a Napoleonic coach. The age limits for entrants are 12 to 19 years, inclusive, divided into junior and senior groups. Several innovations have been planned in connection with the 1934 competition which will increase the influence of the guild as a factor in the American school system.

In past years the closing date for the contest has always been July 1, but this year the time has been extended to midnight, July 21.

For information, write secretary, W. S. McLean, Fisher Body Craftsman's Guild, Detroit, Michigan.

Educational Program for C.C.C.

An extensive educational program has recently been adopted for the Civilian Conservation Corps. The purpose of the program is to strengthen and broaden the educational plan now being carried out, under the direction of the War Department and under the general supervision of the director of emergency conservation work.

The program will comprise instruction suited to the needs of all camps, with the thought of providing a program that will benefit the worker when he returns to the normal working field. An advisory committee has been formed, comprising the heads of the different departments of the government. This committee will meet at various times to make recommendations to the Office of Education regarding the educational program.

An educational adviser will be in general charge of the educational program in each camp. This adviser will be responsible for the supervision of the educational activities and for the development of the educational program. He will advise and counsel with the enrolled men on their educational program as well as their future vocational adjustment. A camp assistant will serve as assistant leader. It is planned to use the hours other than normal working periods and periods of inclement weather for purposes of instruction.

Summer-School Sessions of Carnegie Institute

The Carnegie Institute of Technology, Pittsburgh, Pa., is offering a six-weeks' industrial-arts course for teachers for the 1934 summer session. The regular course extends from June 22 to August 3. A two-weeks' course in woodworking and practice teaching may be taken from June 11 to 22.

New Publications

The Archery Workshop

By L. E. Stemmler and Paul H. Gordon. Paper, 91 pages, 4 by 6¾, illustrated. Published by L. E. Stemmler Company, Queens Village, L. I., New York.

This booklet instructs the beginner in the principles of archery. It also contains a glossary and bibliography on archery.

Woodworker's Handbook

Cloth, 127 pages, 6 by 9, illustrated. Published by Walker-Turner Co., Inc., Plainfield, N. J.

This little handbook is a practical manual intended to help the home worker in planning, installing, and operating power machines in his workshop. It includes descriptions on how to make a number of interesting pieces of furniture.

Instructional Manuals for Paper Hangers

Unit Two, by Claude H. Ewing. Paper, 58 pages. McGraw-Hill Book Co., New York. The second of a series of manuals on paper hanging. The material is presented in job-sheet form,

(Continued on page 9A)

KANSAS STATE TEACHERS COLLEGE

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Director of Summer Session
THE STOUT INSTITUTE MENOMONIE, WISCONSIN

(Continued from page 8A)

and the proper sequence of operations is stressed. A list of operations, tools and equipment, material, and other technical information necessary for each job has been included.

Machine Drawing

By Charles L. Griffin and Robert H. Fortman. Cloth, 288 pages, 5¾ by 8½, illustrated. Price, $2. Published by American Technical Society, Chicago, Ill.

This book in a rather comprehensive way covers the field of machine drawing. It contains a great deal of material that ordinarily would be found in books on machine design.

SchoolShopEquipmentNews

STANLEY PORTABLE ELECTRIC TOOLS

The Stanley Electric Tool Company, Inc., of New Britain, Conn., has issued a six-page folder, describing and illustrating its line of portable electric tools, comprising drills, screw drivers, hammers, safety saws, bench grinders, and sheet-metal-cutting tools.

Of special importance is the Stanley edge-tool grinder No. 567, a portable, electric, full ball-bearing tool for school and industrial woodworking shops. The motor and wheels are especially designed for sharpening plane irons, chisels, and other edge tools. The tool holder takes plane irons up to 2⅝ in. wide and beveled-edge and square-edge chisels of any size. The grinding attachment makes it easy for an inexperienced operator to properly grind plane irons and chisels. The tool holder may be easily lifted from the bracket, for inspection of the tool, at any time.

NEW SOUTH BEND METAL-WORKING LATHES

The South Bend Lathe Works, South Bend, Ind., has issued its new Catalog No. 94, describing its complete line of South Bend lathes, attachments, and tools suitable for work in the machine shop, electrical shop, automotive service shop, and laboratory.

(Continued on page 11A)

INDUSTRIAL ARTS COURSE

FOR TEACHERS

Summer Session

CARNEGIE

INSTITUTE OF TECHNOLOGY

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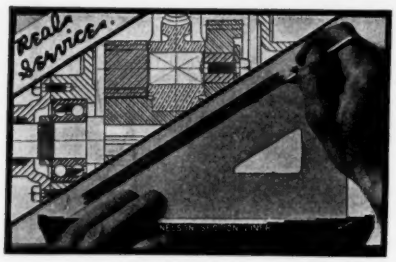

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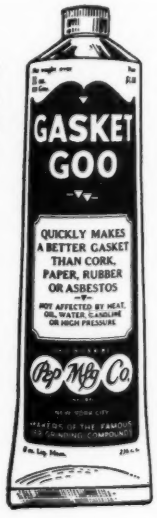
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(Continued from page 9A)

The catalog, which is the latest and most complete of its kind, describes and illustrates 96 sizes and types of lathes, from the small bench lathe to the large swing lathe, as well as a line of gap-bed and brake-drum lathes. All of the lathes are of the back-geared, screw-cutting type.

The newest line is the Underneath Belt Motor-Driven Lathe, which incorporates a number of new features, affording safety and greater convenience for the operator and more power and quietness for the machine. Other models of the motor-driven type are the Silent Motor Drive and the Countershaft Drive.

NEW NELSON SECTION LINER

The Nelson Section Liner Company, De Kalb, Ill., has placed on the market a new instrument for drawing cross-section lines with equal spacing.

The section liner is intended to be used with the T square and triangles, and will help industrial-arts and engineering students in eliminating the guesswork method in their crosshatching on drawings. It is made of laminated Bakelite and may be obtained in red, green, black, or golden brown color.

Complete information and prices are available upon request.

CLAYCRAFT CERAMIC MATERIAL

The Claycraft Company, manufacturers of clay products, Columbus, Ohio, has issued a booklet on Claycraft ceramic material for use in school ceramic shops.

A ceramic material, especially adapted to school use has been produced as a result of careful study on the part of the firm's engineering research department. The material includes various types of modeling clays, color stains, engobes, prepared pottery bodies, and a series of plaster molds and electrikilns.

Complete information will be furnished any school shop instructor, or art director, upon request.

NEW BOOKLET ON DRY BATTERIES

The National Carbon Company, Inc., New York City, manufacturers of the "Ever Ready" dry batteries, has just issued a 96-page booklet, entitled *Fun with Dry Batteries*. The booklet describes in simple language a number of inexpensive electrical construction projects, including magnets, toys, locks, switches, and bells. The booklet is a practical handbook of how to make electrical devices that can be operated with dry batteries. It sells at a very small price.

NEW PIPE WELDING BOOK

Fabrication of Oxwelded Piping is the title of a 160-page booklet just issued by The Linde Air Products Company, 205 East 42nd St., New York City.

The book tells how to cut welding time in half on any kind of piping, how to make stronger joints, how to design, lay out, construct, erect, and maintain a welded piping system. It offers step-by-step procedures for welding steel, cast-iron, copper, brass, and lead piping and for making fittings right on the job. Seventy-five illustrations and twenty reference tables explain every problem connected with the welding of piping. Other features are chapters on testing for pipe work, inspection methods, testing welded joints, and estimation of costs.

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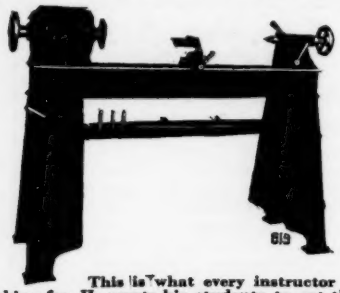

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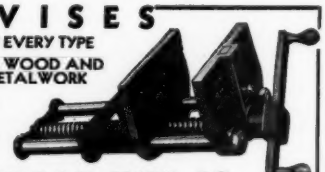

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